FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP FEBRUARY 1, 1957

Department Food Tech
Amherst Massachusetts

CLARK'S
CARAMEL
for COLOUR

A colour of natural origin permitted
in foodstuffs in all countries.

Clearly—
CLARK'S for CARAMEL

Brown & Polson Ltd
INDUSTRIAL PRODUCTS DIVISION
WELLINGTON HOUSE, 125/130 STRAND, LONDON, W.C.2.

If no single packaging material will do...

consider a LAMINATION by Metal Box

a LAMINATION is made by bonding together with adhesive two or more layers of different materials. The moisture-proofness of one may be joined with the strength of another and the appearance of a third. Variations can be made in relative thickness, and the possibilities are both numerous and exciting.

a LAMINATION may enable you to save space, save weight, cut out breakage, reduce spoilage, open new markets with unit packs, carry out sampling schemes, or simply lower your normal packaging costs.

The knowledge of laminations possessed by Metal Box makes it worth your while to consult them first whenever you are considering whether a lamination may be the kind of packaging material best suited to your product. Write or phone *to-day* to

THE METAL BOX COMPANY LIMITED
Plastics Group
THE LANGHAM · PORTLAND PLACE · LONDON W.1.

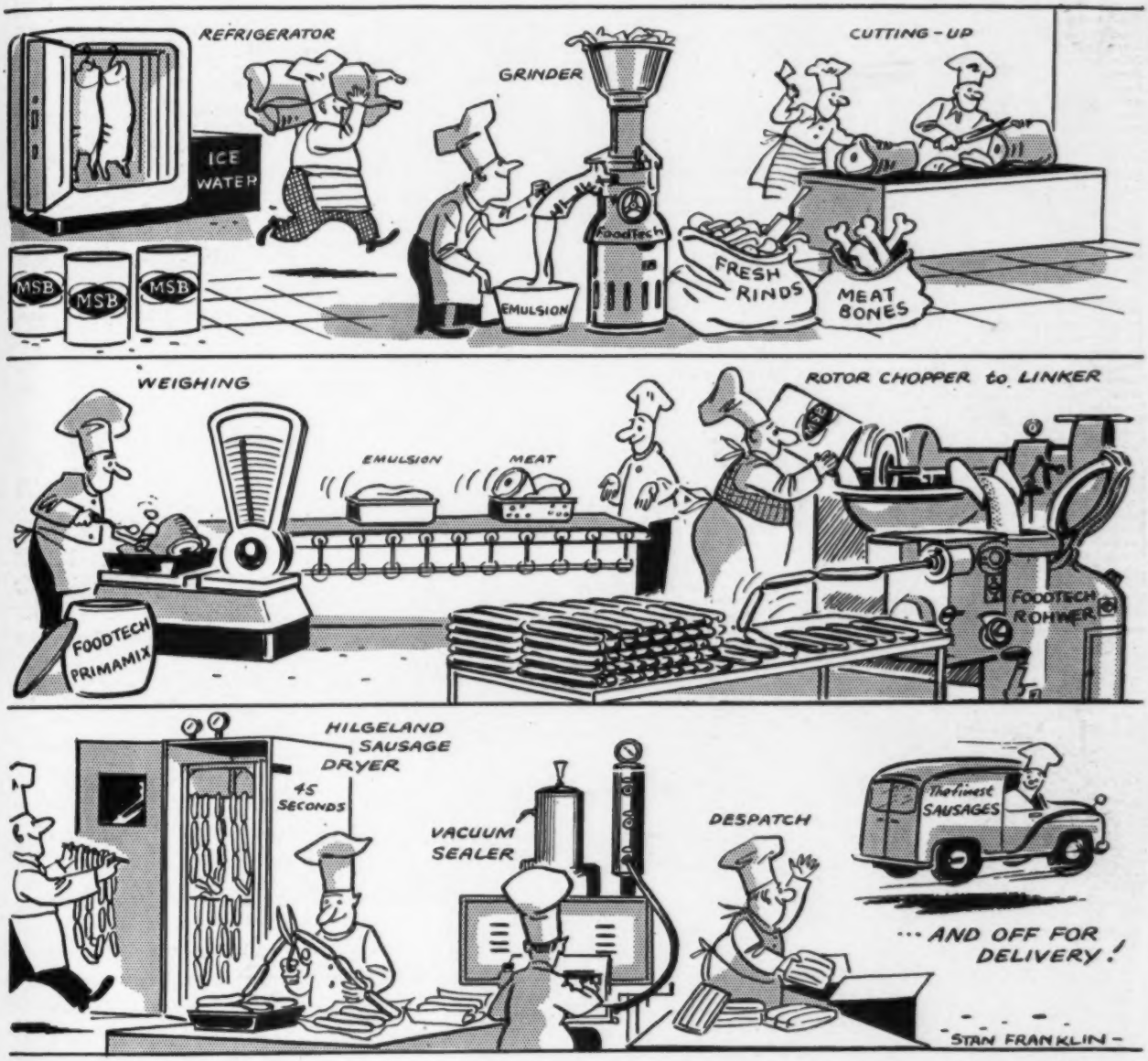
BATCHELORS
use
TRIPOLAM X
for their successful soup pack

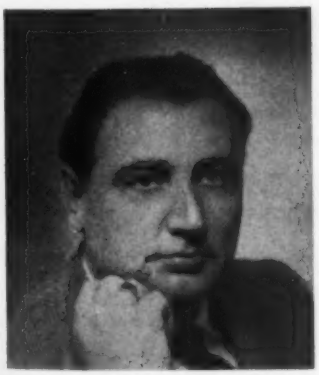
Aluminium foil x paper x aluminium foil—moistureproof, strong, rigid, heatsealable, non-toxic, capable of being printed in multi-colour and/or embossed.

Ask about other Metal Box laminations

HB n/01

Sausages . . . the **Foodtech** *way*





THERE are sausages and sausages. But with Foodtech materials and machines your product and your production can always be maintained at top level. Why not consult us?

The services of our Managing Director, Mr. Helmut Hilgeland, are also at your disposal. He will be pleased to advise—in strictest confidence—on any aspect of sausage-making, meat curing, canning and factory layout.

FOODTECH LTD

Queen Anne's Place, Bush Hill Park, Enfield, Middlesex.

Telephone: LABurnum 6656/7

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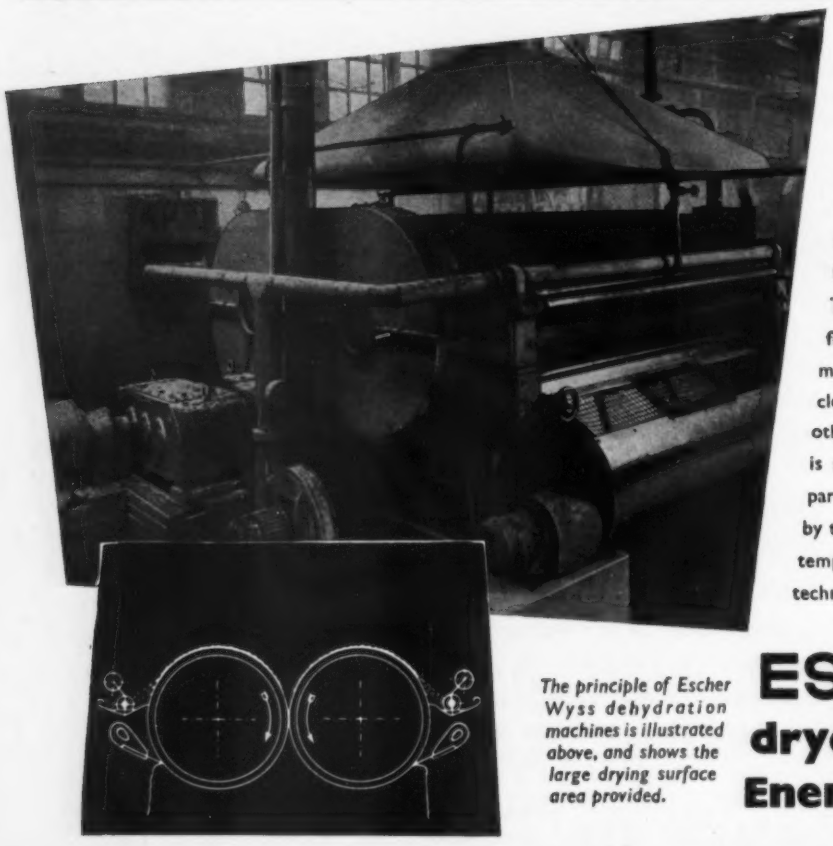

The de-hydration plant installed for Messrs. Energen Foods Co. Ltd. is typical of the Escher Wyss system—the most advanced method of moisture extraction from heat-sensitive substances. Multiple spinning discs pick up the liquid which is thrown centrifugally outwards to the edges of the discs. Two adjacent air jets project the liquid, as a fine mist, on to the drying drum. With this method there are no small pipe lines to become clogged, which is unfortunately frequent with other methods. Because this fine mist of liquid is sprayed on to heated drums, there is a comparatively large surface exposed to the heat and by this means, drying can be speeded up, at low temperatures. We will be pleased to supply full technical details of these machines.

The principle of Escher Wyss dehydration machines is illustrated above, and shows the large drying surface area provided.

ESCHER WYSS dryers at Energen Foods Co. Ltd.

ESCHER WYSS LIMITED, TERMINAL HOUSE, 52 GROSVENOR GARDENS, LONDON, S.W.1. TELEPHONE: SLOANE 8101

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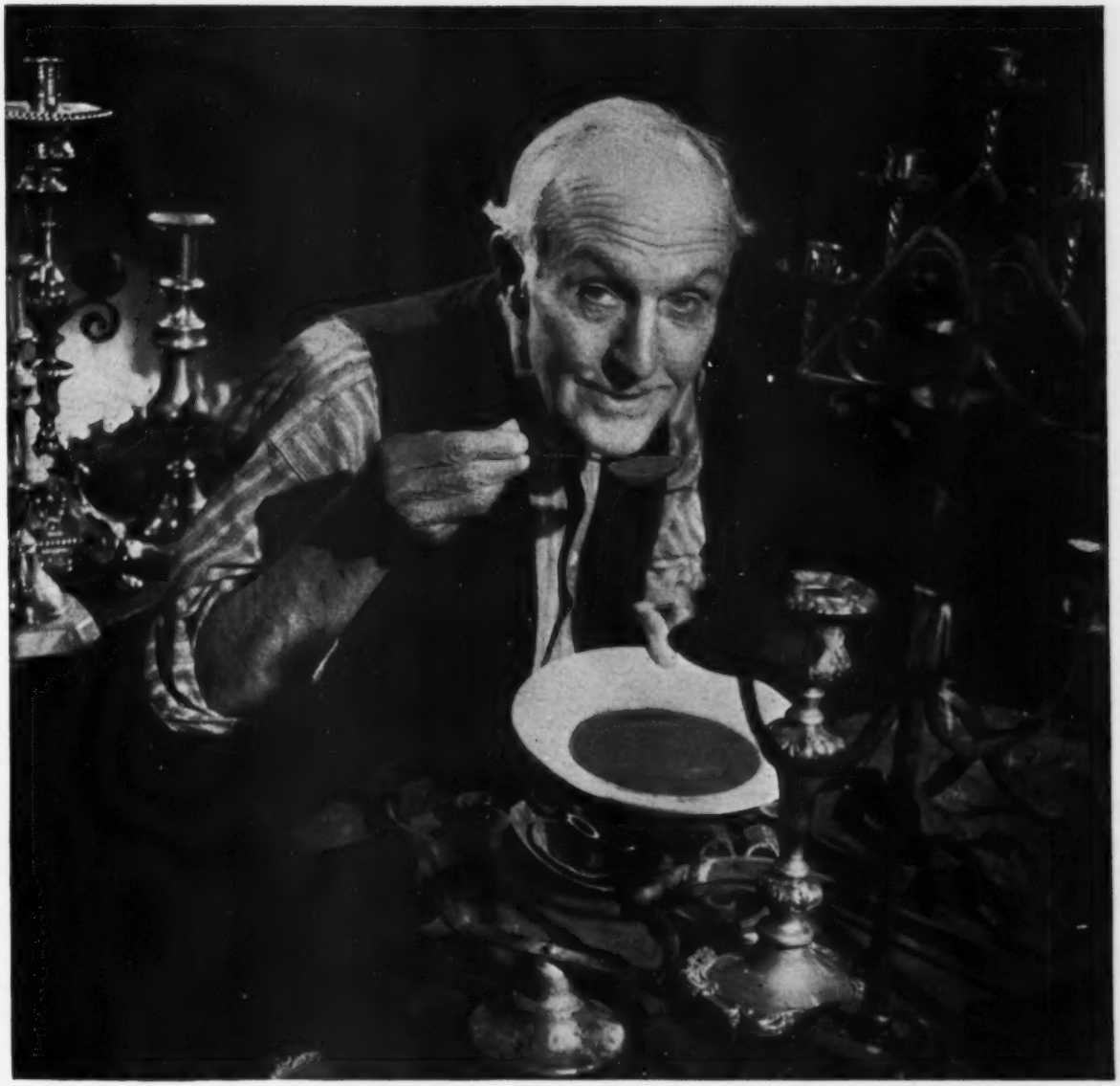

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FM/11

Cockade BRAND MILK POWDERS

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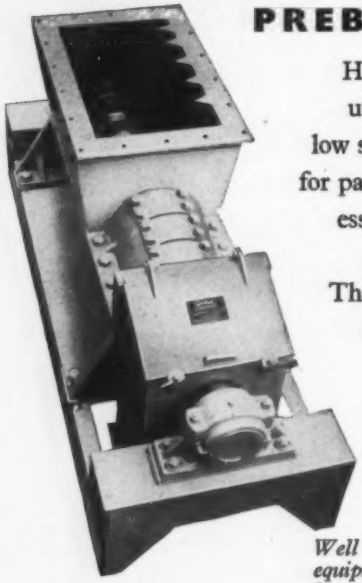
Scott-Reitz

FOOD PROCESSING EQUIPMENT



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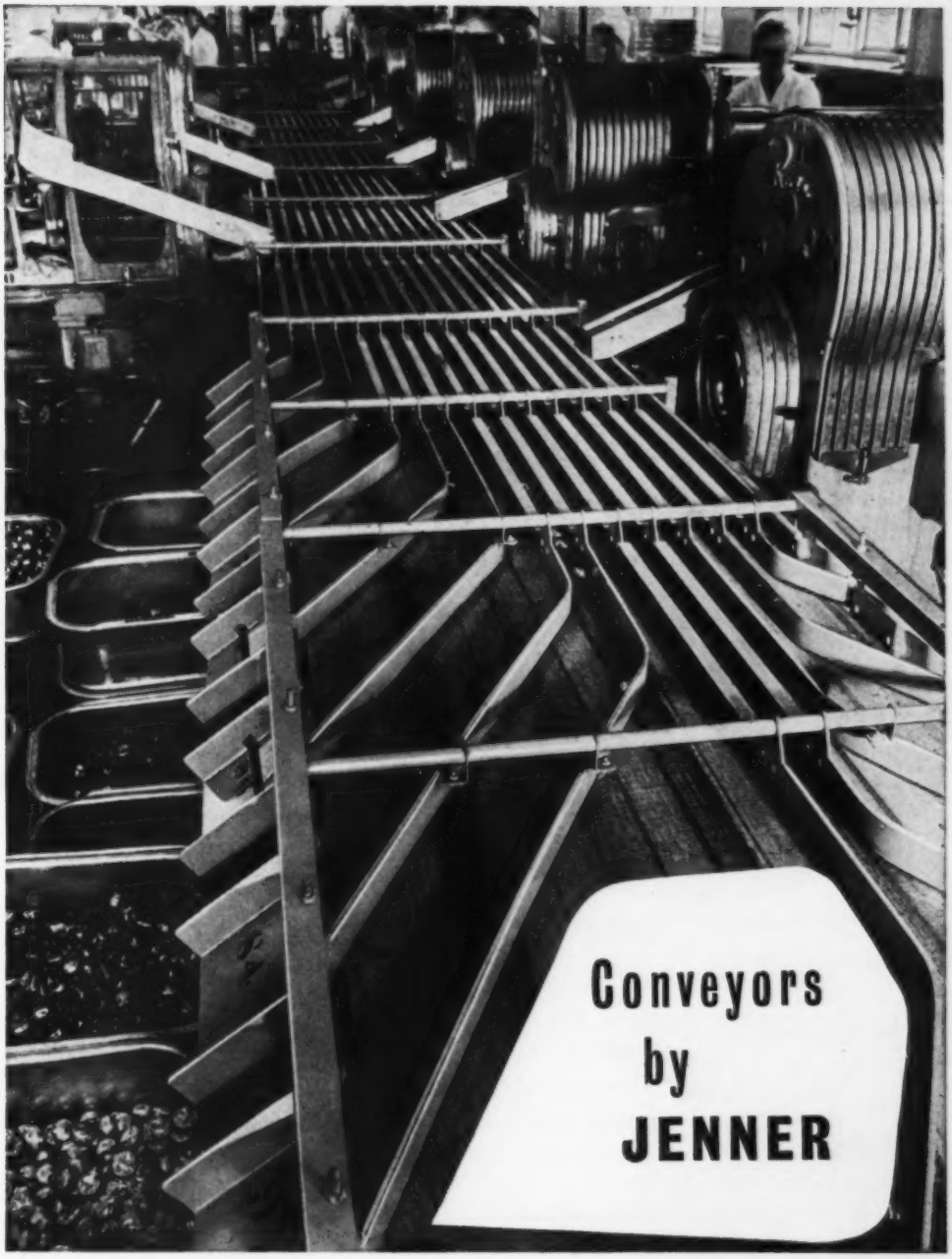

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ICING SUGAR	350/.00-lbs.	87 or 67%	,,	300	,,	,,

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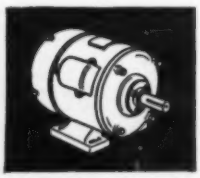
The odd thing is that, with the best will in the world, the chef cannot tell you what he does that makes the difference. It is even more odd that something similar can happen with an engineering company that has been in business for a long time. This is because the solutions to many of the problems that arise in the translation of a specification into a fractional h.p. motor are supplied by the experience and knowledge you cannot find in text books. This is why, even in these days of standardisation, a name with a long history still counts for something.



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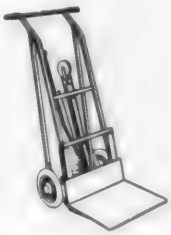
MODEL-IA
Lifts 3 cwts.
to 3′ 8″

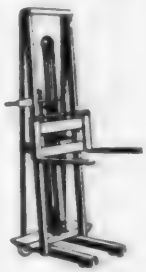
MODEL-I
Lifts 2½ cwt.
to 3′ 1½″



HAND TRUCK
Approx. maximum load
3 cwt.

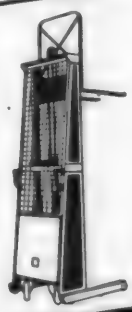
MODEL-II
Lifts 5 cwt.
to 4′ 11″

MODEL-IIIB
Lifts 7 cwt.
to 5′
Hand, Battery or Mains Operated



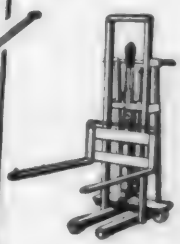
MODEL-IVA
Electro-Hydraulic Stacker
Lifts 7 cwt. to 7′

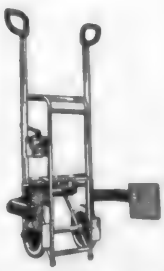
MODEL-V GRIPPA TRANSPORTS
6 cwts.



'SHERPA' TUG-LIFT

MODEL-IIIA
Lifts 7 cwt. to 3′ 10″
Hand or Mains Operated





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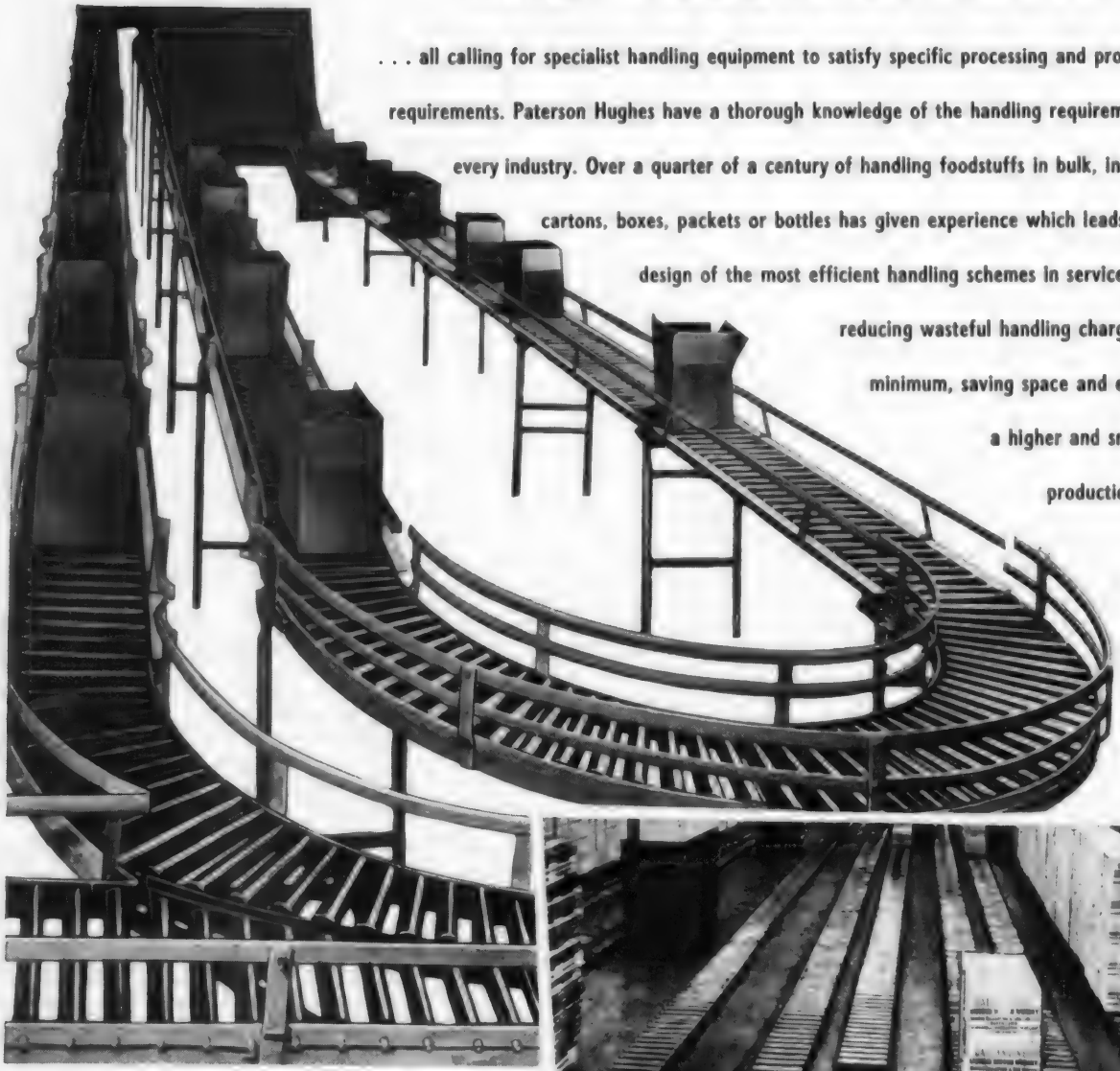

Photograph by kind permission of Rowallan Creamery Ltd., showing Gravity Roller handling Margarine

Gravity rollers handling Liqueur Scotch Whisky: photograph by kind permission of George Ballantine and Son Limited

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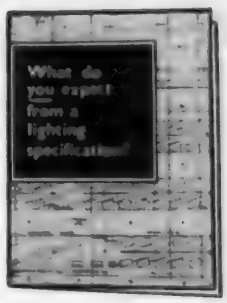
The Benjamin Illuminating Engineering Service brochure, shown opposite, describes how our lighting engineers plan and prepare a lighting specification on request. This service is free of charge or obligation. Please write or phone for more information.



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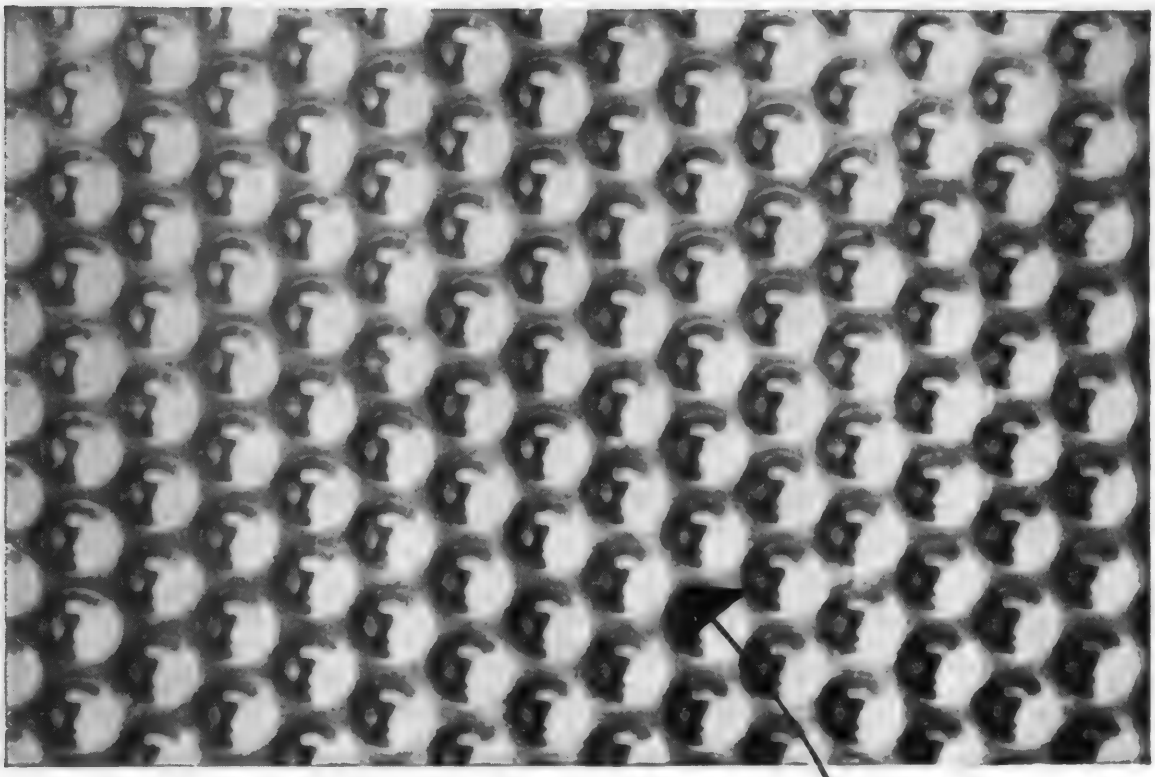

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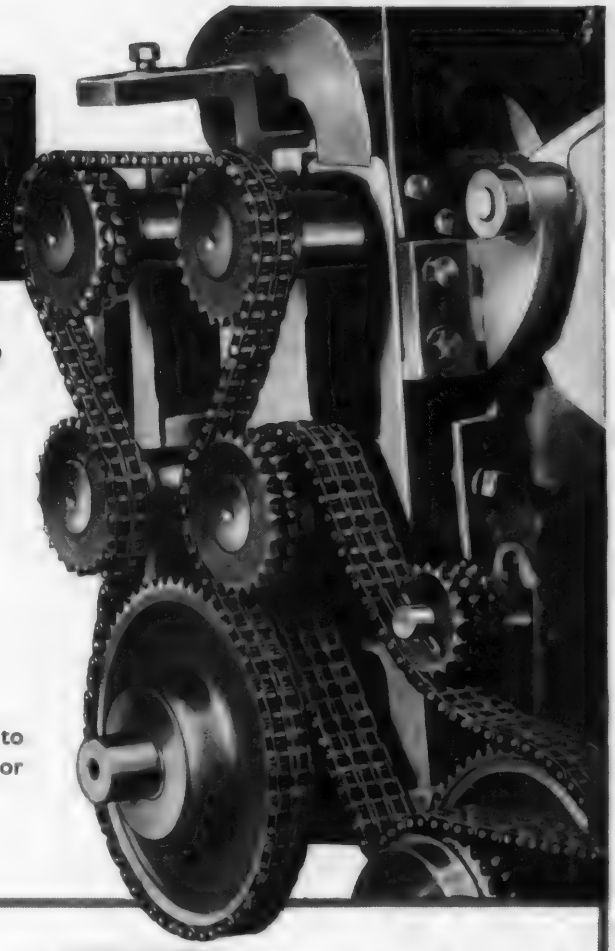

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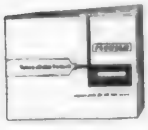
FLEXILE The name of the future in collapsible tubes



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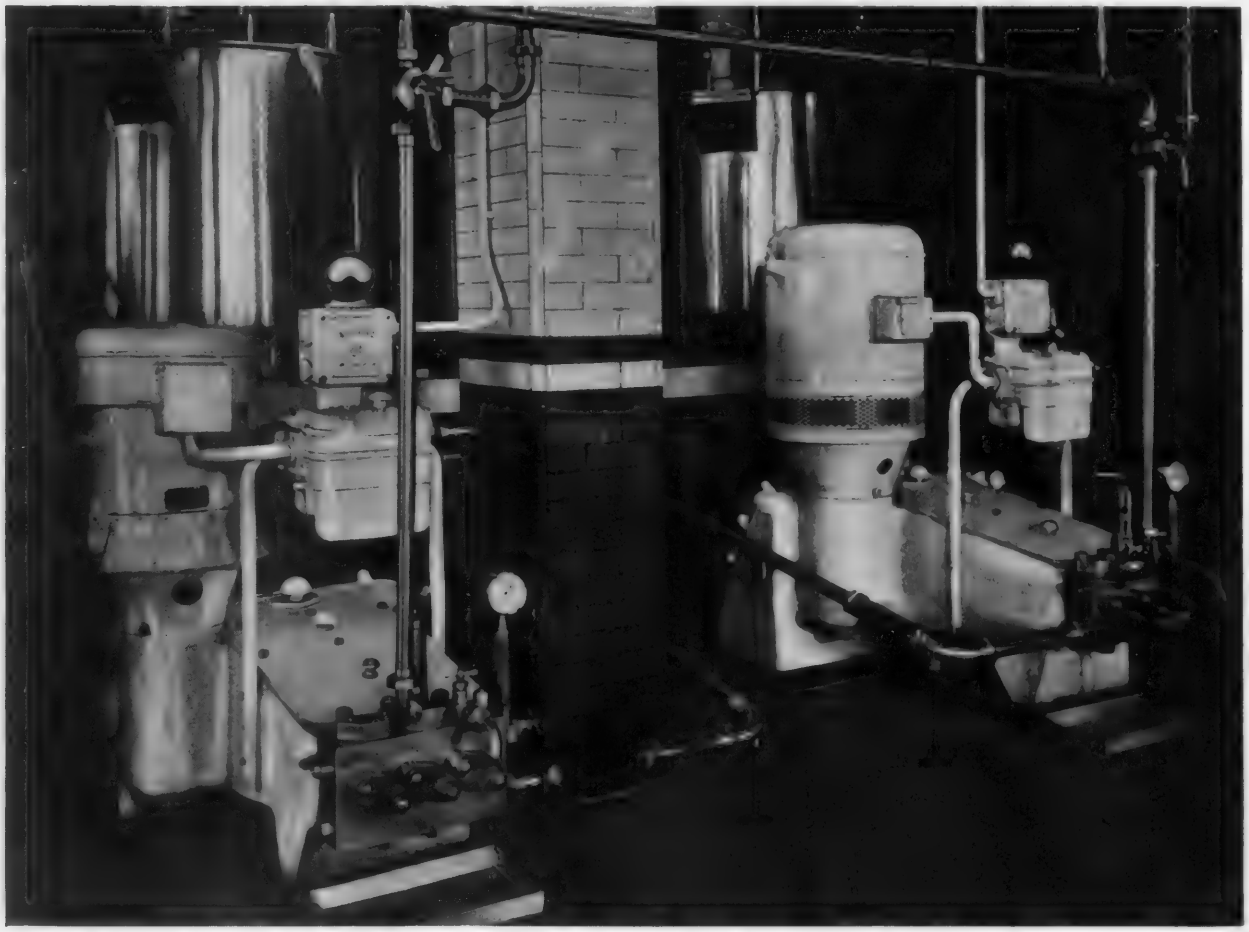

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'HILTON'
4½" diam. x 3½" deep

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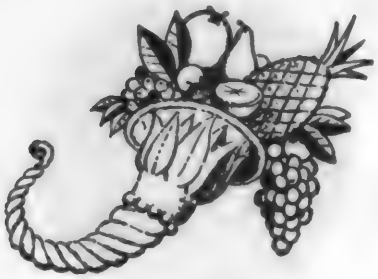

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Metal Box
'know-how'
at work for you

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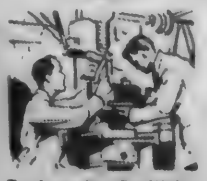
Metal Box designers have hundreds of case histories to call on when planning your container.



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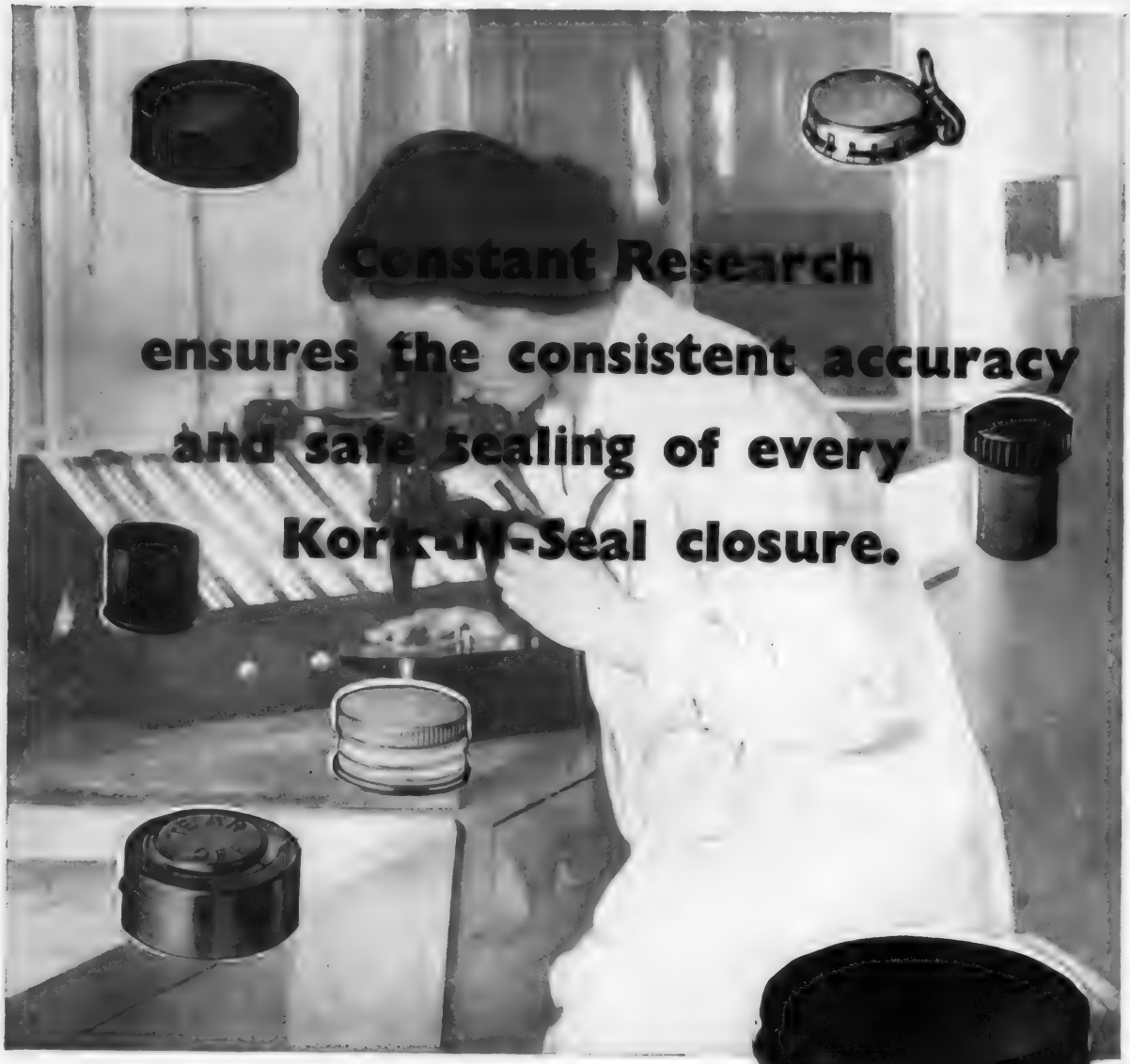

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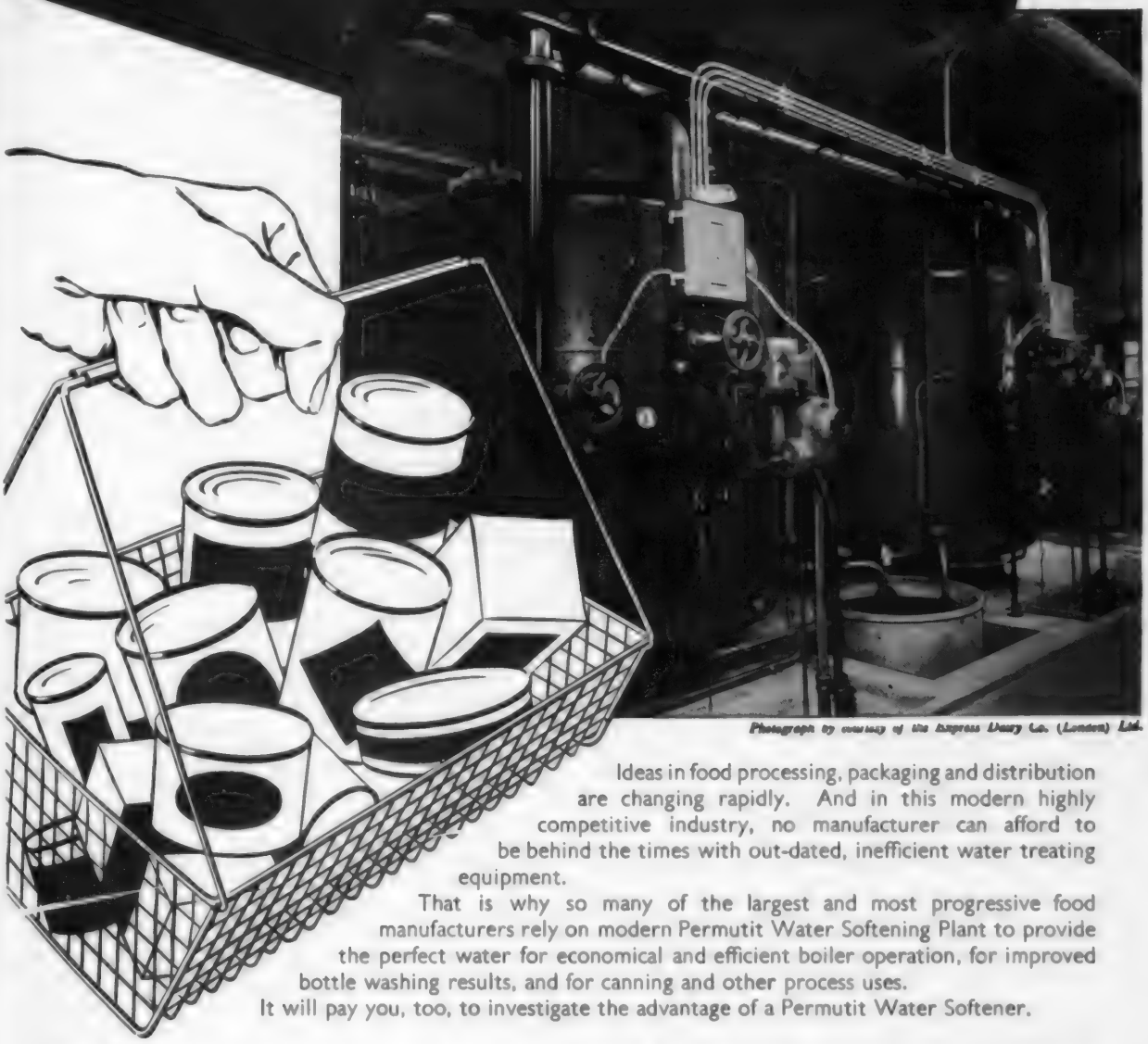

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Ideas in food processing, packaging and distribution are changing rapidly. And in this modern highly competitive industry, no manufacturer can afford to be behind the times with out-dated, inefficient water treating equipment.

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by Metal Box

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The smooth thread makes the Metal Box cap so easy to remove. Available to fit the standard 58 neck ring.

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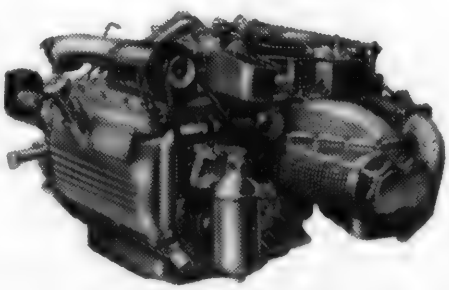

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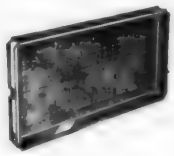
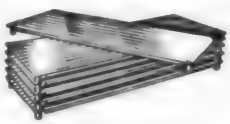
The CHIEF ENGINEER says—

'Strong-light-clean-smooth-easy stacking WARCO has everything'





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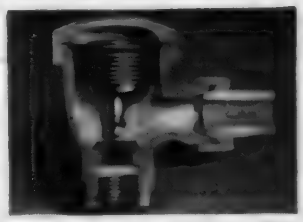

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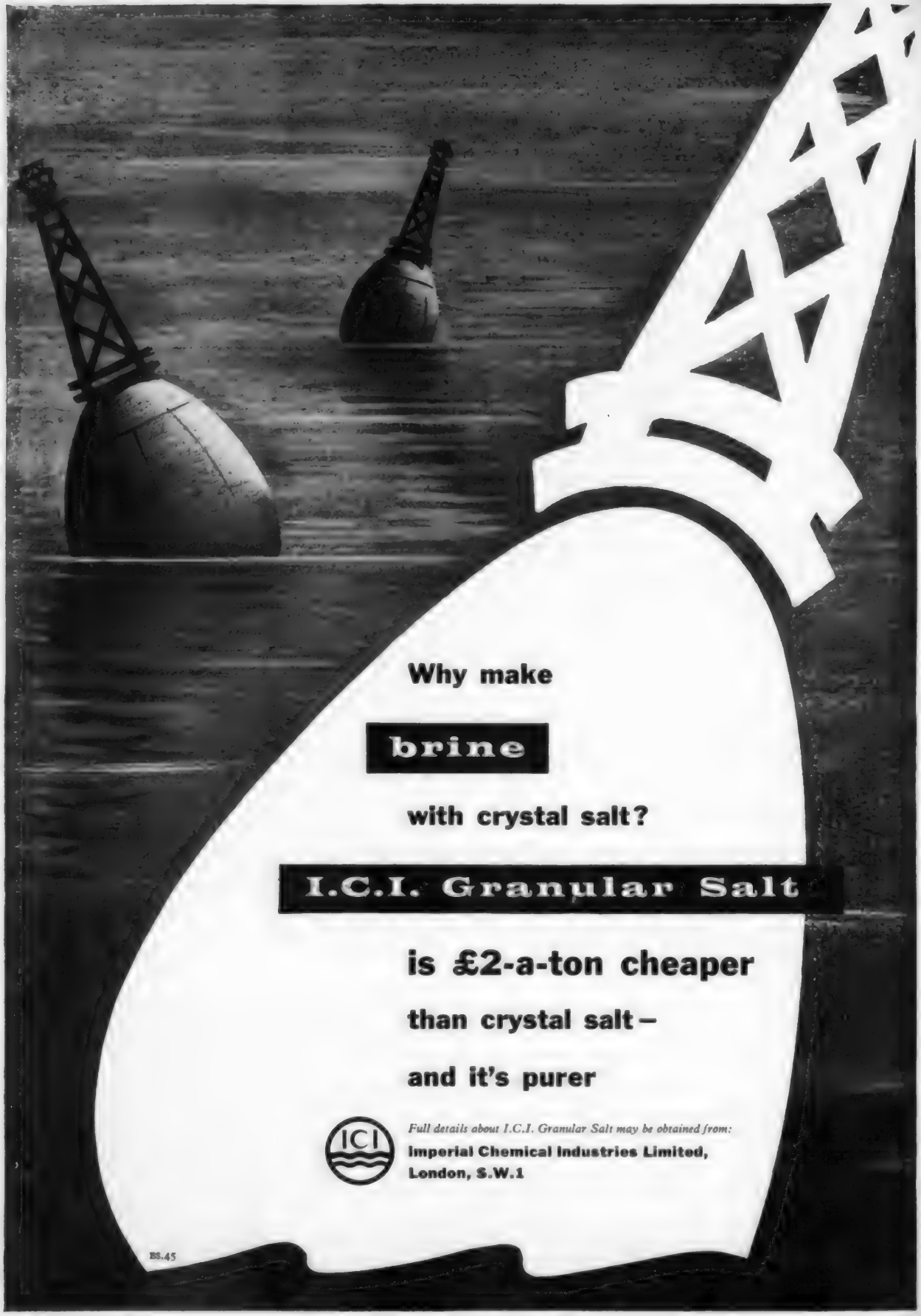
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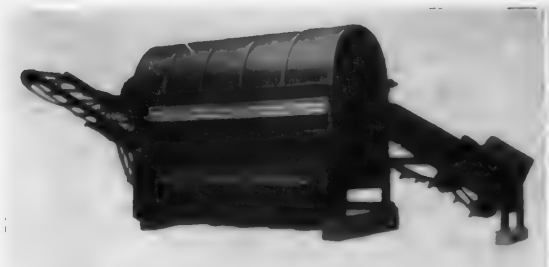

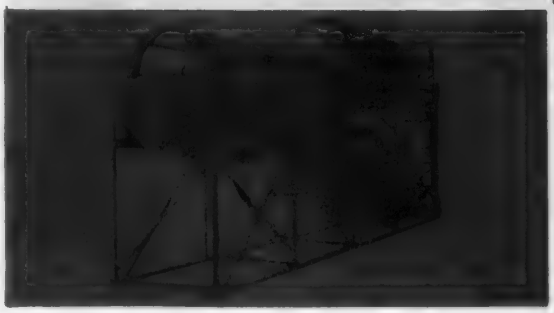

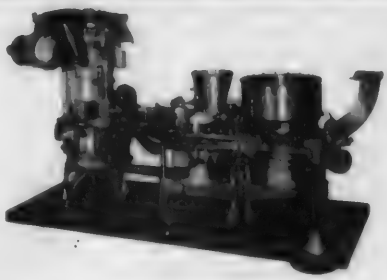

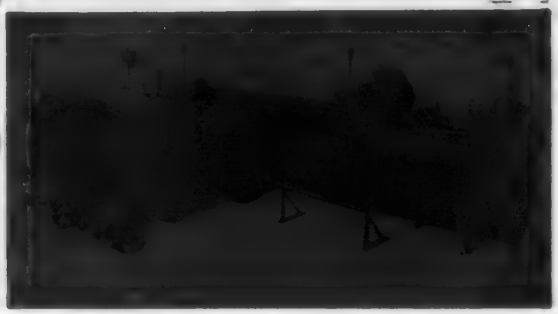

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If you pack peas and are looking for ways to cut costs, see what this specially engineered IMC pea equipment can do for you. First, each item is engineered to do an exacting job continuously and automatically. This greatly simplifies operations, speeds up output, and frequently reduces man-power requirements. Secondly, this equipment is sturdily constructed of high-grade materials—precision-built to run smoothly and efficiently through extended heavy-load periods with a minimum maintenance factor. And thirdly, its outstanding design, developed over many years, provides the gentle handling essential in maintaining the high quality established by the canner for his finished product

Write for full information or call your nearest IMC representative

CAN HELP TRIM RISING COSTS IN YOUR PLANT

Specially Engineered - Keyed to the particular needs of pea packers

1 Scott Viner I.M.C. type 563/4
Capacity up to 500.800 kg. and more of peas per hour. Corresponding to 3.600-4.000 kg. of Vines

2 Super Cleaner I.M.C.425
Capacity up to 3.000 kg. per hour.

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Capacity up to 9.000 kg. per hour.

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Synchronised with C C C AUTOMATIC Closing machine C R type I.M.C. 425.
Speeds up to 325 cans per minute.

6 F. M. C. Continuous Cooker & Cooler Lines (I.M.C series 700-729)
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and other food preparation and processing equipment for canners, freezers, etc. to handle Fruits, Tomatoes, Vegetables, Milk, Fish, Meat, Oils etc.

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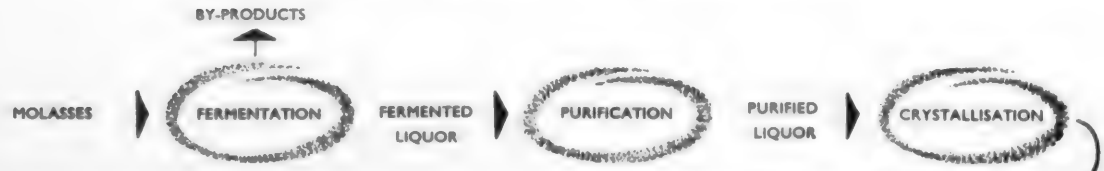
Formerly the industry relied entirely on imports of lemon juice and citrate of lime from Italy, but in 1930 Sturge introduced a new process for producing chemicals on a commercial scale by mould fermentation. This Sturge fermentation plant was the first of its kind to be operated in this country and finally enabled a by-product of home-grown sugar beet to replace imported materials.



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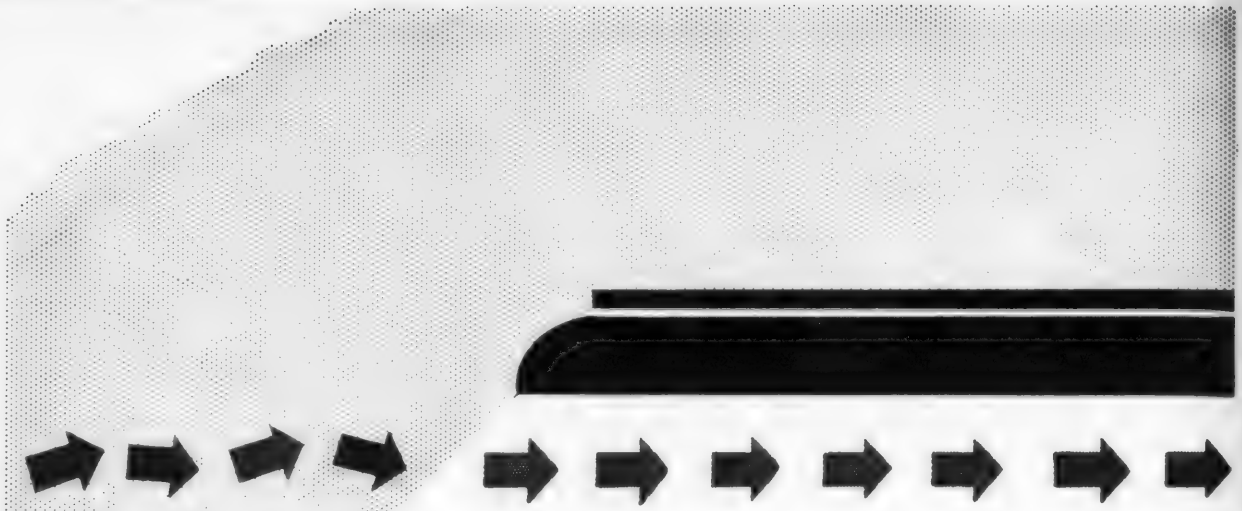

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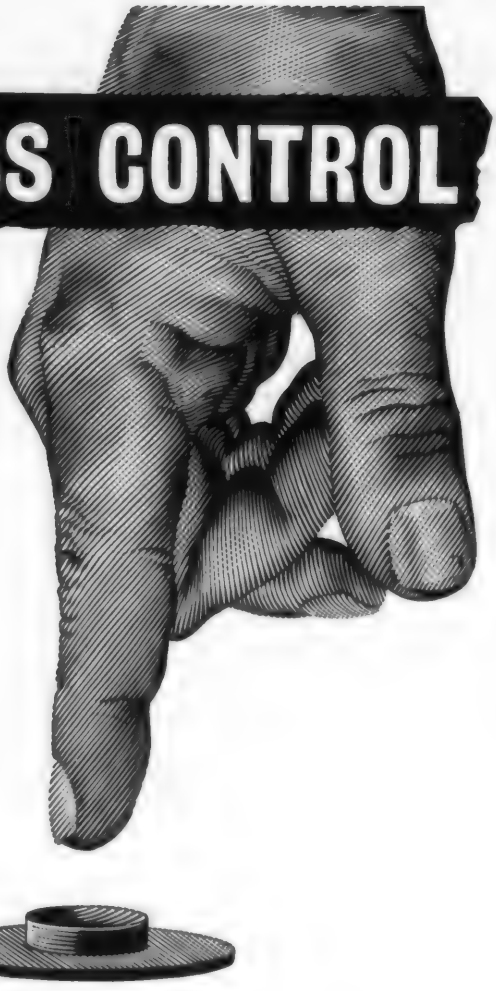

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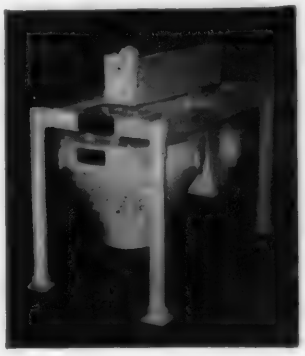

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prevents bin overloading at St. Cuthbert's Bakery, Edinburgh

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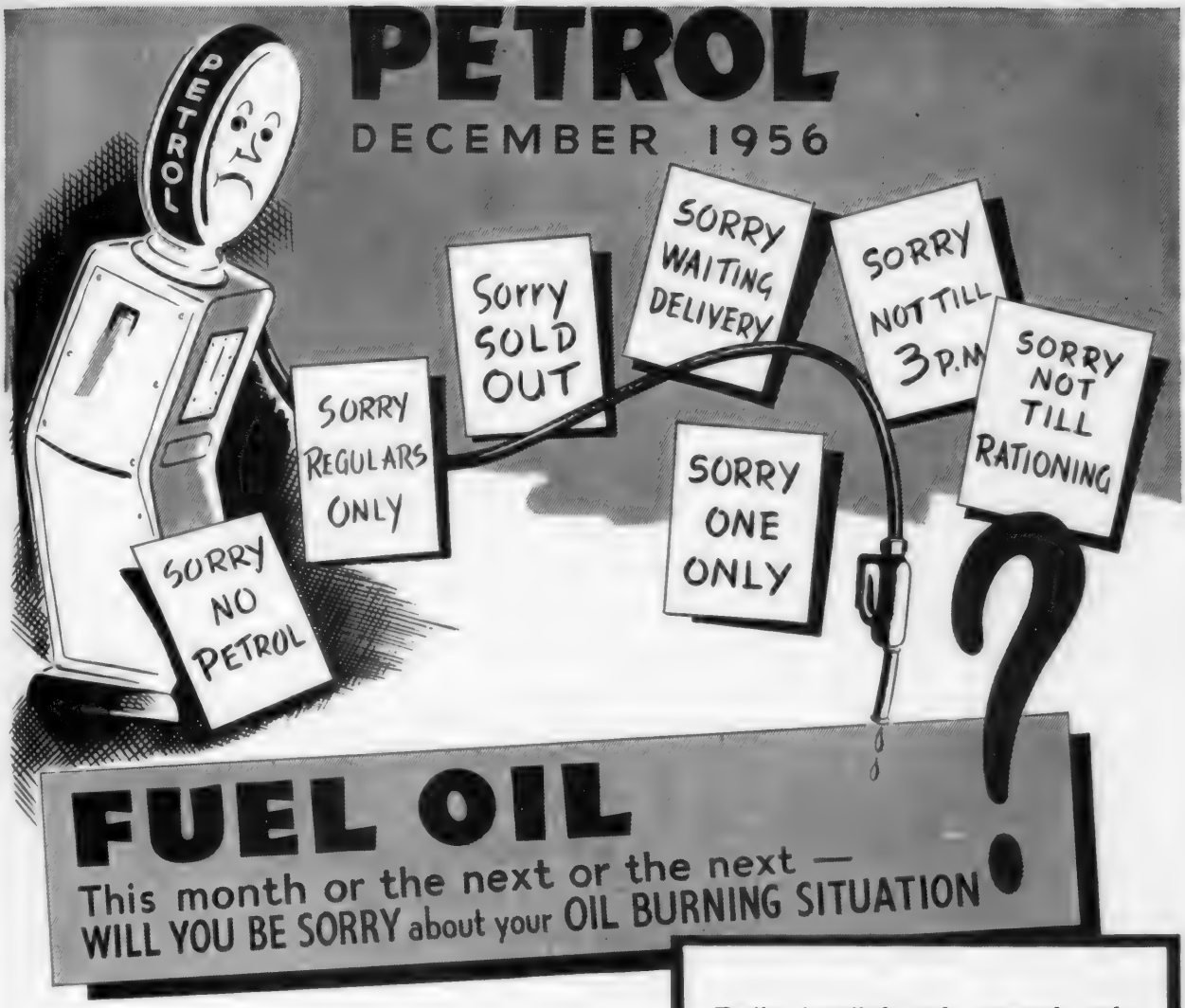

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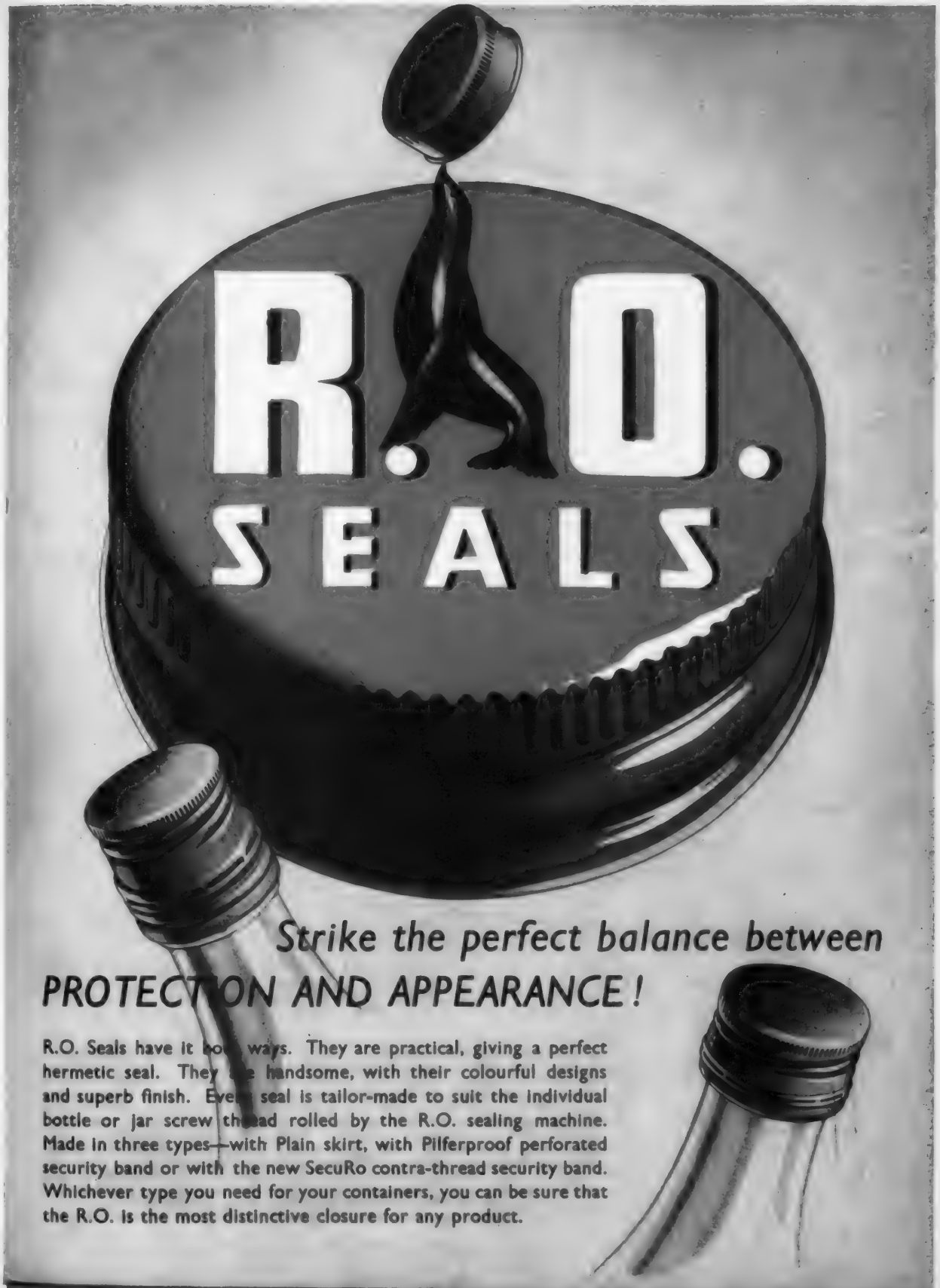

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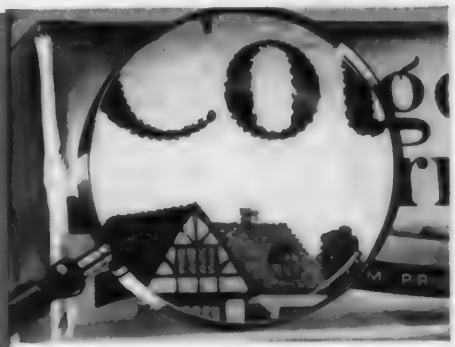

Close-up of package printed by ordinary process

Close-up of package printed by Fisher's photogravure process

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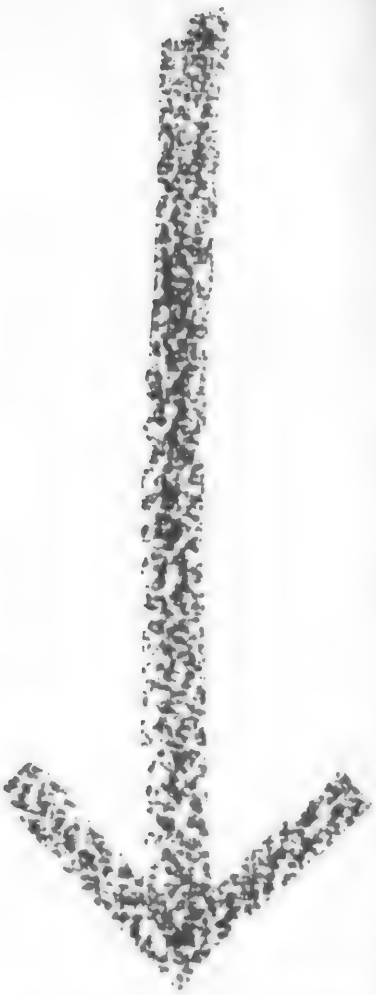

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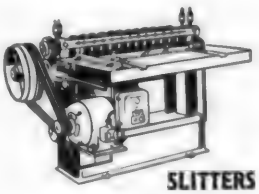

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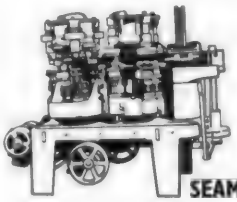

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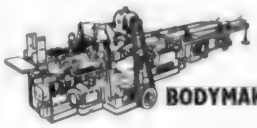

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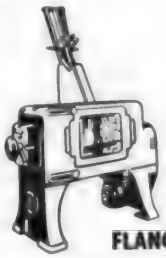

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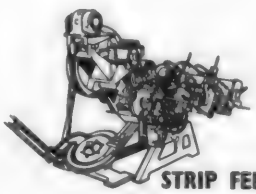

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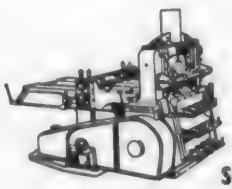

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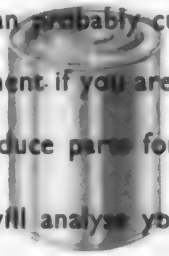

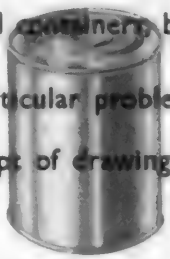

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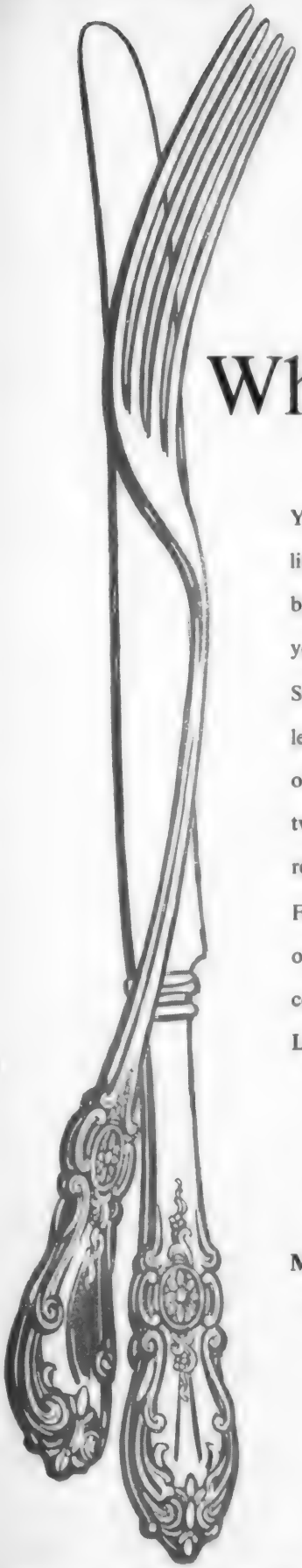

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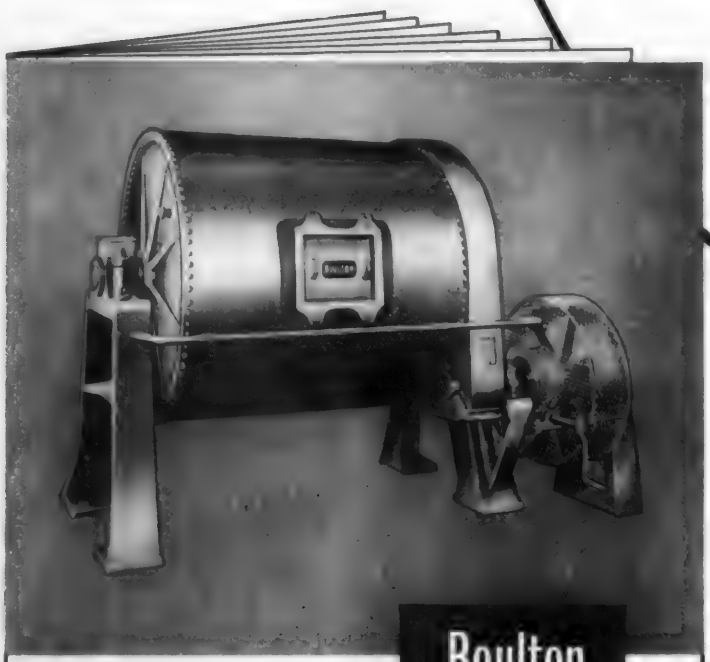

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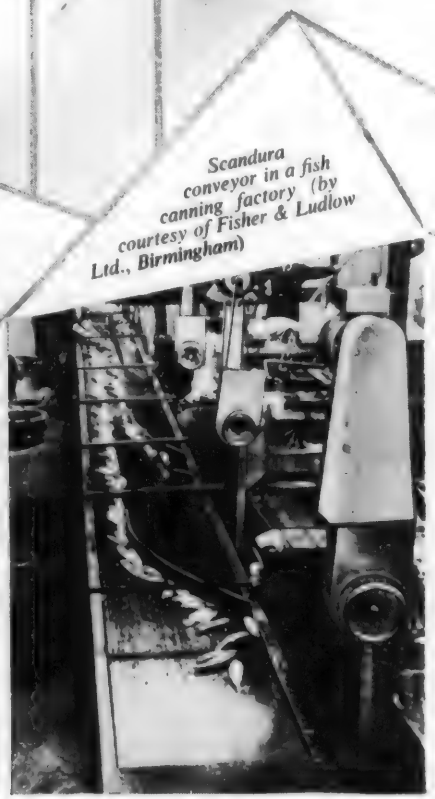

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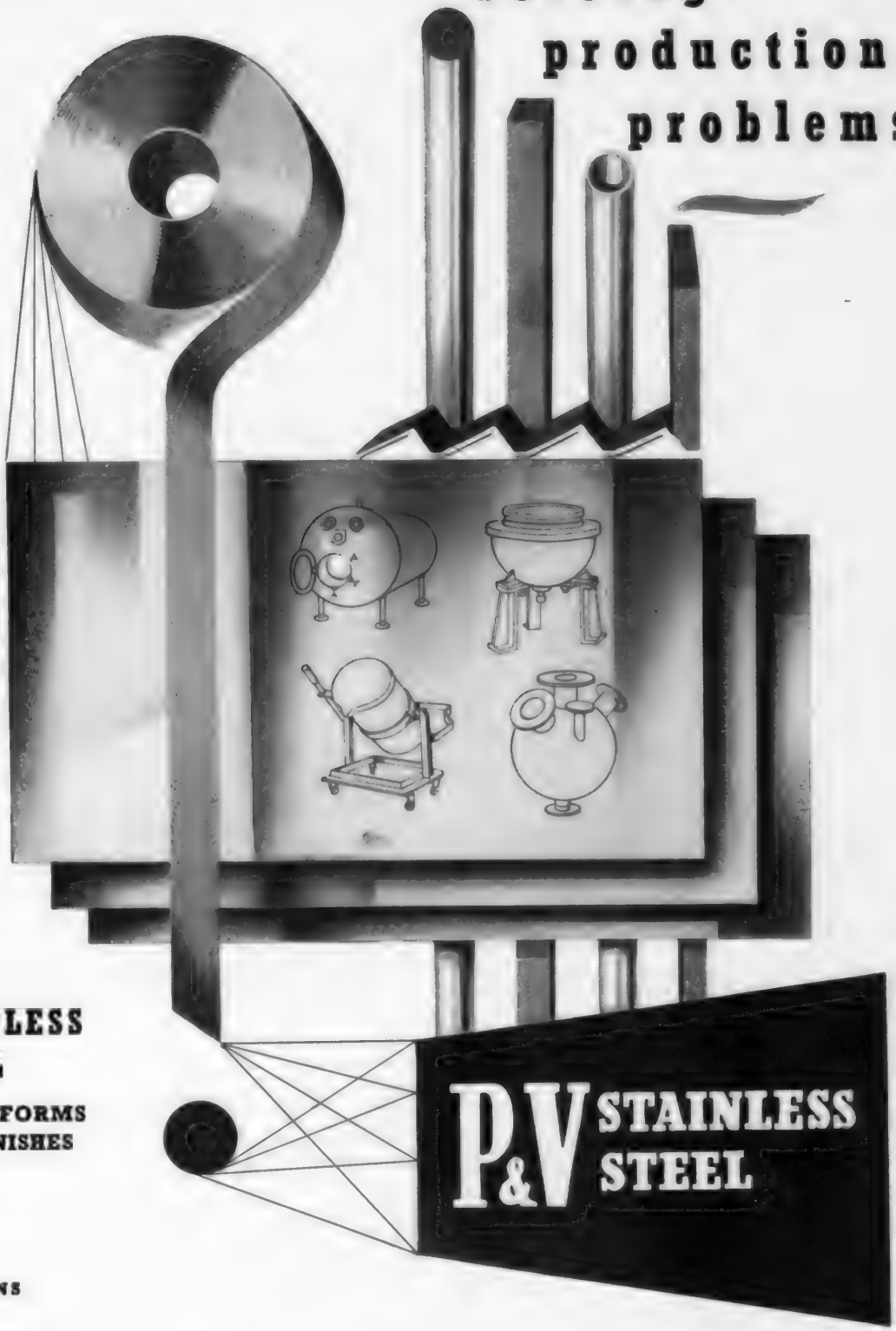

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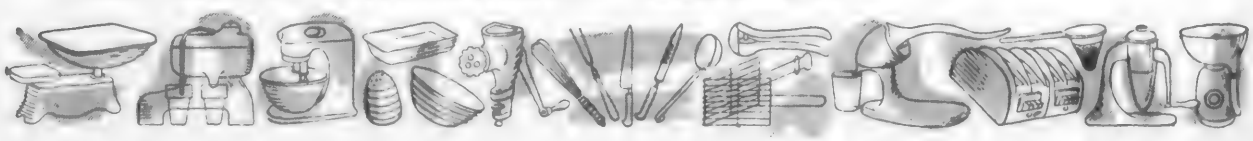

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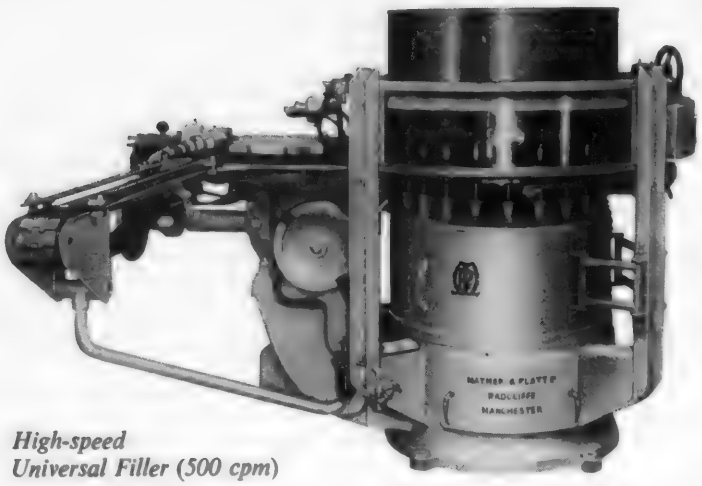

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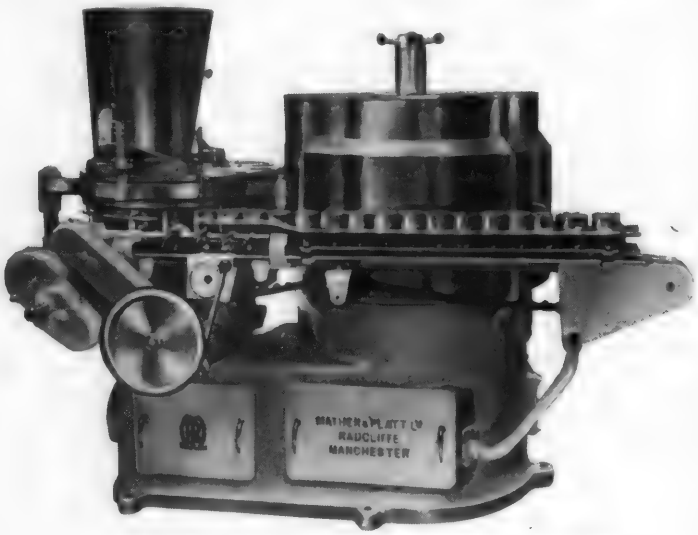

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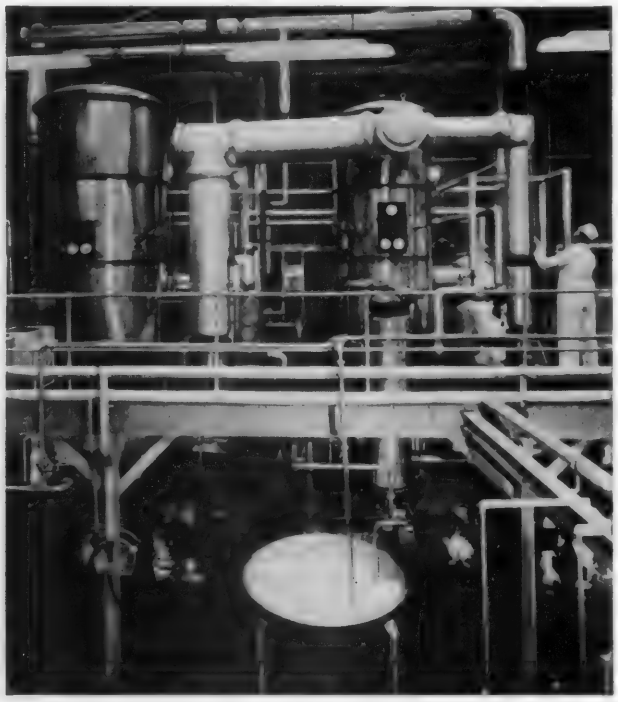

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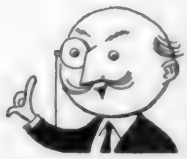

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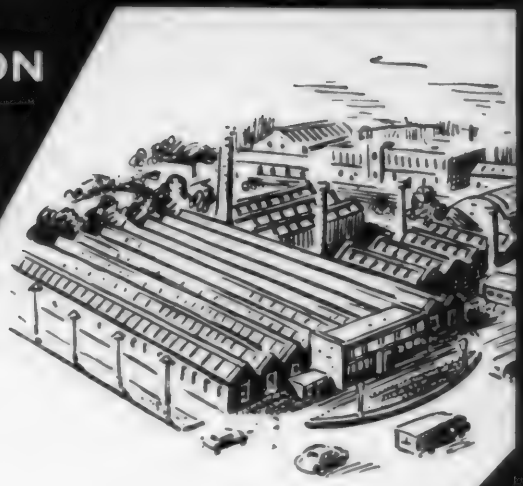

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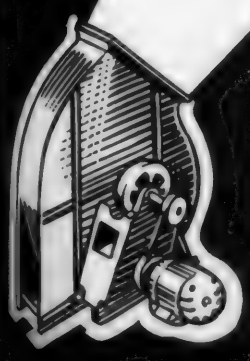

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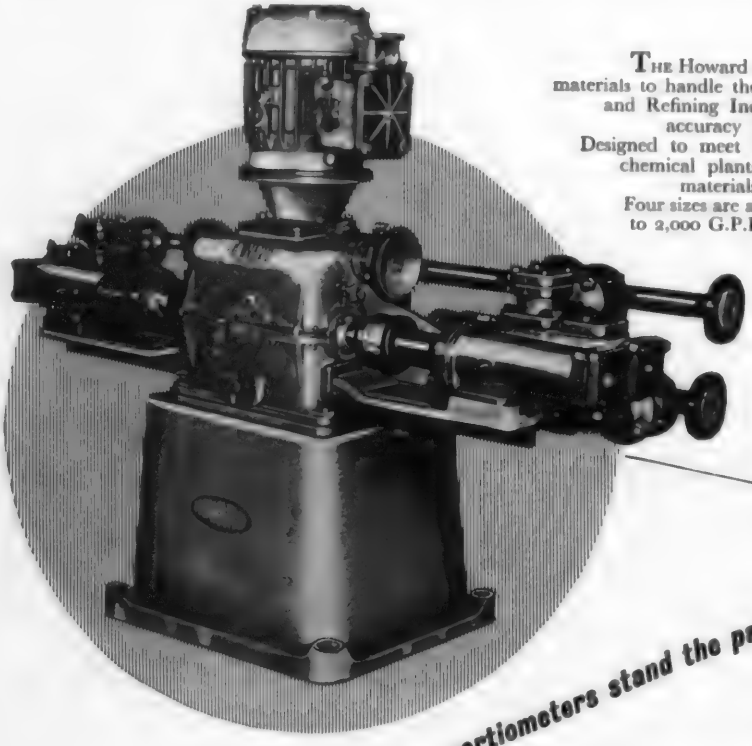

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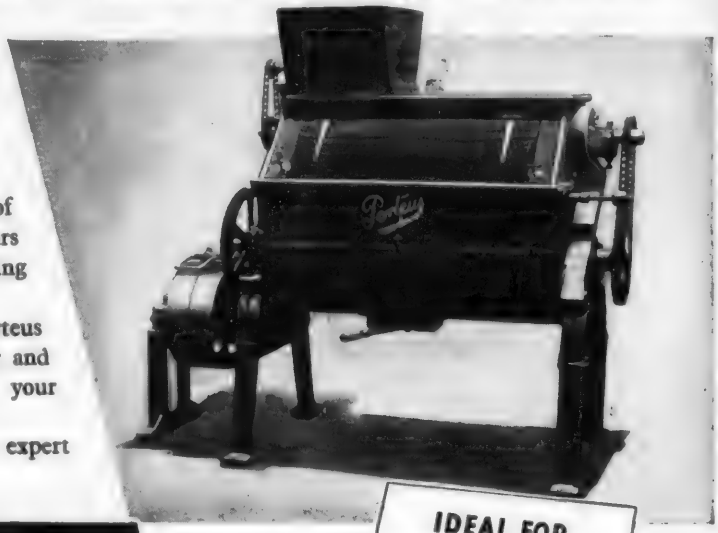

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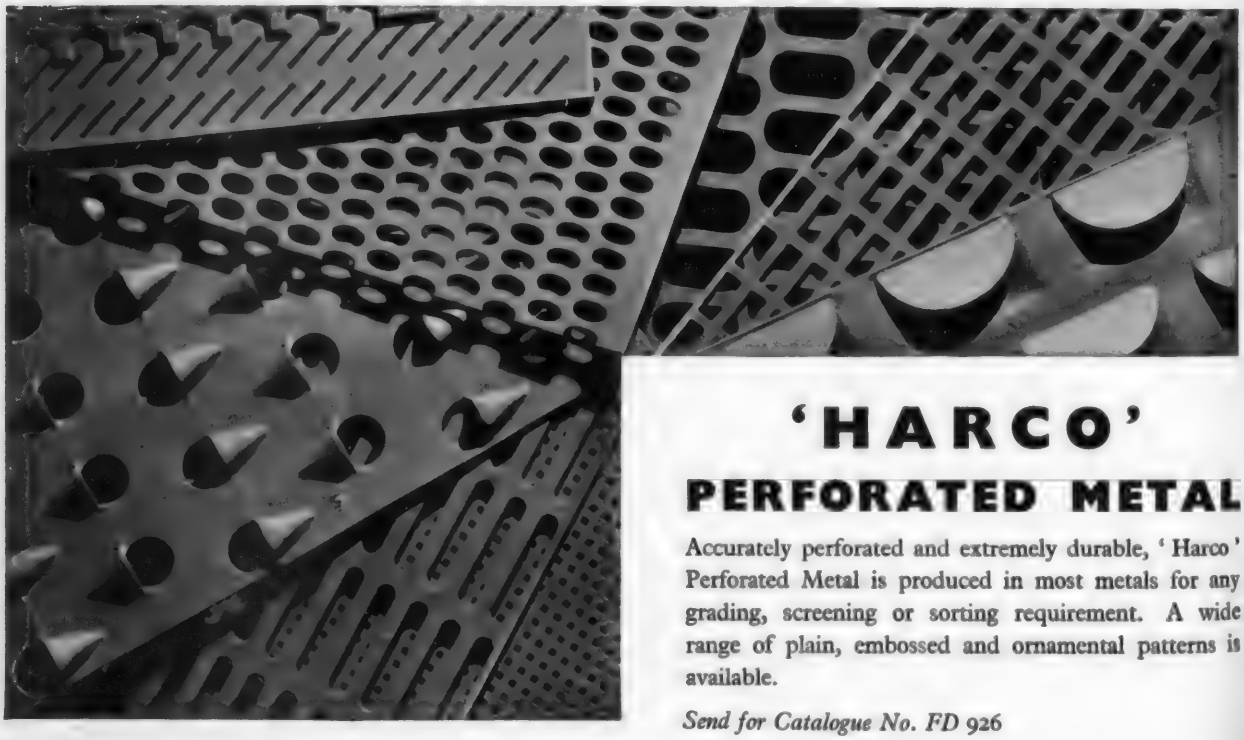

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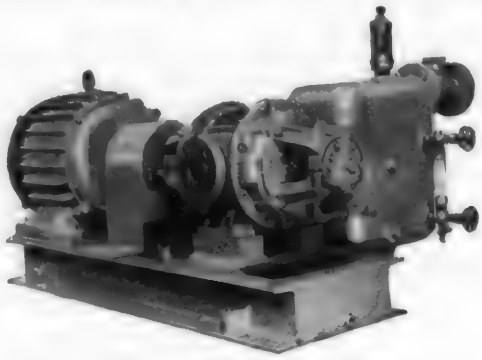

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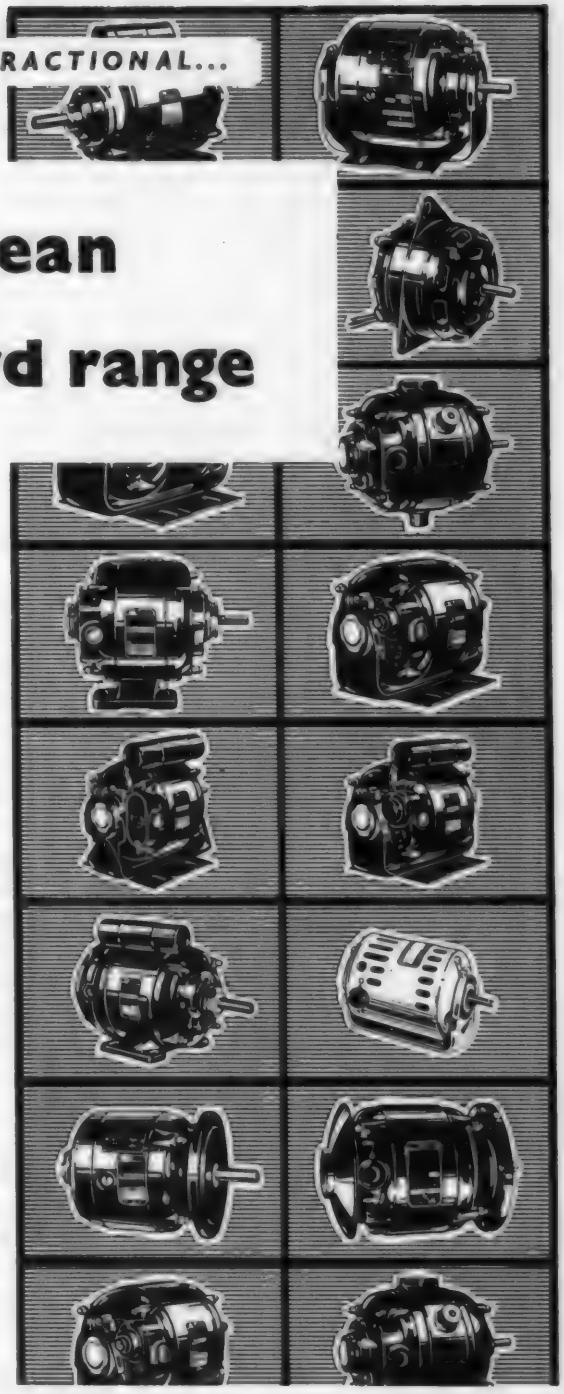

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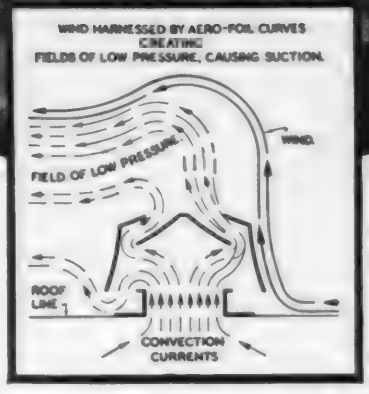
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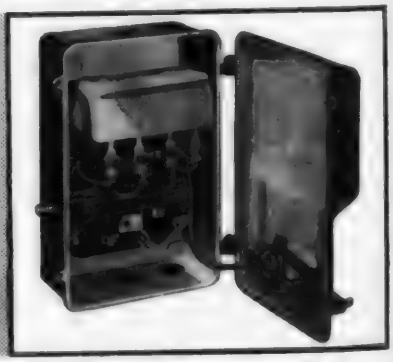

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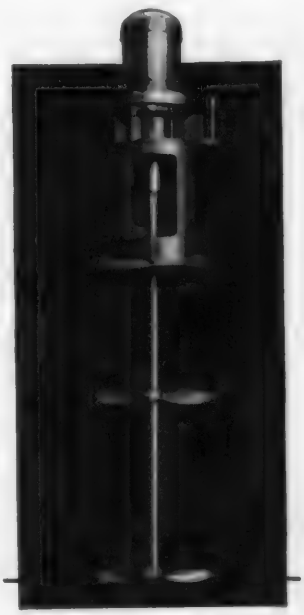

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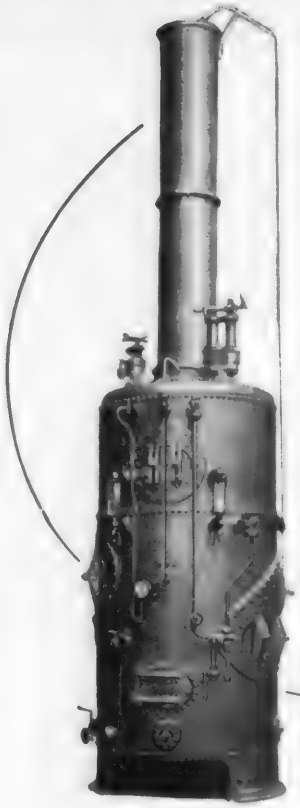

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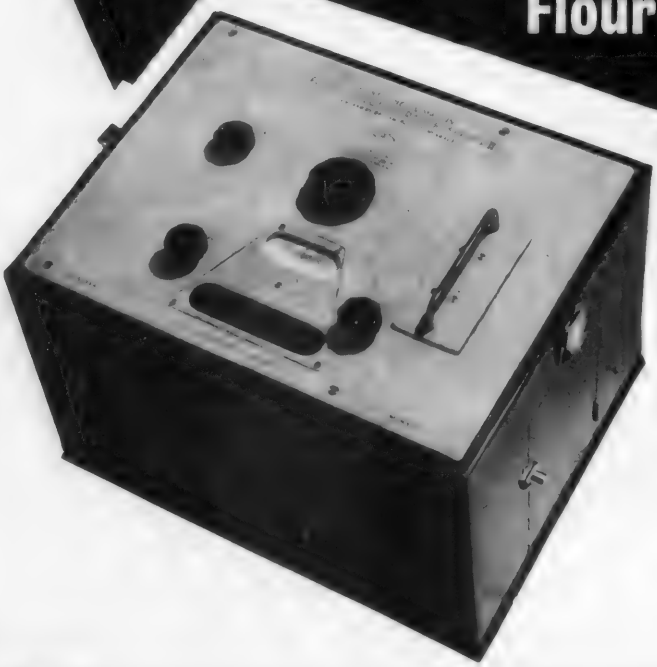

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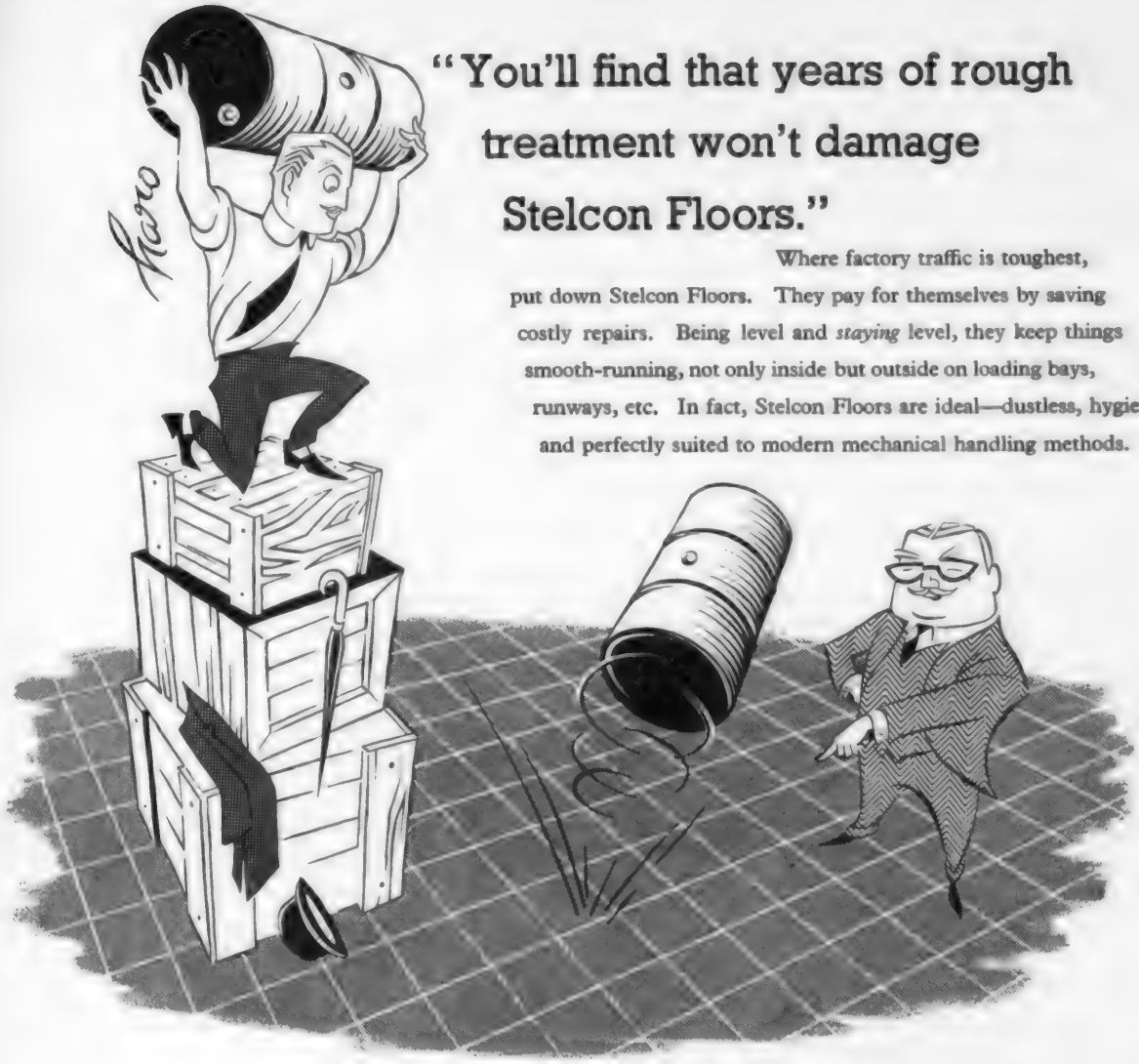

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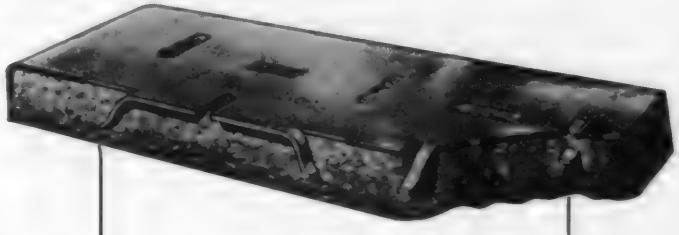

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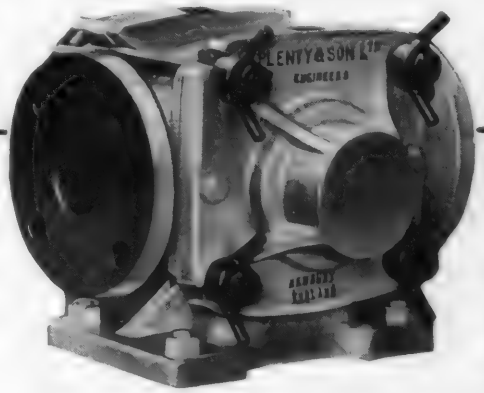

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FOOD MANUFACTURE

Vol. XXXII No. 2 February 1, 1957

Sugar and sucrochemistry

SUGAR has been in the news lately almost as much as petrol. Like petrol, sugar has become dearer, primarily for the same reason. The closing of the Suez Canal caused world sugar prices to rise in November. These increases now have a greater effect in this country because the Sugar Act, which came into force on January 1 and returns sugar importing to private hands, exposes domestic prices to world market fluctuations to a greater degree than hitherto. By the middle of January the basic price of Tate and Lyle granulated sugar in 2-cwt. bags was 86s. per cwt., 15s. 6d. higher than at the end of December. These increases will inevitably make themselves felt in the prices of confectionery, jam, etc., but they have, of course, had an immediate effect on the prices of sugar in the shops. Anticipation of increased prices has led to a certain amount of hoarding and to local shortages of packed sugar which, in turn, gave rise to rumours of rationing. These rumours have been effectively dispelled by Tate and Lyle, who have emphatically denied any possibility of scarcity, pointing out that all they are short of are packages.

In the long term, of course, the problem of the sugar industry is over-production, and it is this which has stimulated research into what is called sucrochemistry. The purpose is to find profitable non-food uses for sugar and its by-products. Leading research in this field is the Sugar Research Foundation of New York which recently announced the licensing of a process for making detergents and emulsifying agents from sugar esters. Seven firms have been licensed, one in Denmark, two in France, one in Cuba and three in the United States. Several British firms have expressed interest. The products are made from the methyl esters of fatty acids and sucrose by an alcoholysis reaction, a marriage of fat and sugar. They are said to be excellent and innocuous detergents, completely indifferent to hardness in water. It is also claimed that they can be produced at prices strictly competitive with petroleum-based detergents. The harmless nature of these detergents would commend them for use in the food industry as cleaning agents and as emulsifiers. Sugar ester added to food is reported to make it more digestible and thus of great benefit to older people, for the failure to assimilate fat efficiently is a common digestive complaint.

Drying oils for paints, plastics, pesticides and organic intermediates are other likely end-products of sucrochemistry. While the main job of the sugar industry will always be to supply the world with an important food, the development of ancillary uses for sugar should strengthen its ability to overcome the problem of gluts and generally lead to greater stability and efficiency.

Less British fish

WHILE the general trend in Europe and elsewhere in the world is towards an increased catch of fish, figures for the United Kingdom catch show little variation in recent years and are less than those for pre-war years, according to the "FAO Yearbook of Fishery Statistics" (Vol. V, Production and Fishing Craft, H.M.S.O., 15s. net).

In 1955, the British catch was 1,099,700 metric tons as compared with 1,197,800 in 1938 and 1,205,800 in 1948. Nearly every other European country has steadily increased its catch since the war, though there is little change in the catch of France; 530,300 metric tons were caught in 1938 as compared with 522,700 in 1955. In 1938 Germany (including East Germany and other areas of pre-war Germany) caught 776,500 metric tons. In 1955 West Germany alone caught 776,900 metric tons.

Fish production in the U.S.S.R. has risen from 1,520,000 (1938) to almost 2,500,000 metric tons (1955).

The ending of the fisheries dispute between Britain and Iceland may have a detrimental effect on some European fish producers. Landings by British trawlers were the same in 1955 (£41 million) as they were in 1951—the last full year of Icelandic landings. Landings by foreign trawlers, however, and in particular by Danish, German and Norwegian vessels, have increased by as much as 50%, and it seems that they will be the losers by the Icelanders' return.

Margarine misconceptions

"Is margarine really made from coal?" asked a reader of a tabloid newspaper recently. He was immediately put right by the paper's advice department.

Margarine, it declared, is made from a number of things, and then proceeded to list them, starting with lard. . . .

This is typical of many popular misconceptions about margarine and other man-made foods. To counteract them Van den Berghs Ltd. have published an advertisement in a journalists' trade paper giving factual information about margarine. In question and answer form concise information is given on margarine's constitution, raw materials, manufacture, nutritive properties, consumption, etc., and a standing invitation is issued to visit Van den Bergh's factories.

The advertisement is in a form which can be easily filed for reference by sub-editors and librarians.

On Van den Bergh's suggestion the advertisement is the first of a series in the paper giving factual information about important industries.

We wish the series success, but there are grounds for pessimism. Not long after its appearance, another daily newspaper forecast a rise in the cost of margarine as a consequence of dearer sugar!

Quiet, please

FOOD manufacturers may be affected by a plan now being considered by the Minister of Housing and Local Government, for new legislation giving local authorities increased powers to intensify their battle against noise.

The idea is that Parliament should be asked to declare the making of noise in certain circumstances to be a "statutory nuisance." The Minister is already preparing a new Bill to consolidate local legislation, and it is expected that a clause dealing with noise will be included in this.

The clause, which is in three parts, has been drafted by the law committee of the Association of Municipal Corporations, and provides that any "excessive or unreasonable or unnecessary noise or vibration which is prejudicial to health or a nuisance or an annoyance to householders or to occupiers of premises" is to be a "statutory nuisance."

The second part lays it down that in any proceedings brought in this way a defendant should prove that he has used the best practicable means for preventing or mitigating the nuisance.

The third part of the clause declares that the complaint must be made by not less than three occupiers of premises within the vicinity. It also lays it down that local authorities' right to make byelaws is not to be affected.

This move by the association's law committee follows a full-scale survey of noise nuisances throughout the country and, in particular, their effect on public health.

Lorries starting up from cold, street hawkers' cries and the bangs and clangs made by the transfer of goods from one vehicle to another were among the thousand and one noises complained of. But such noises as the hum of the butcher's refrigerator, the whine of the slicing machine and the drone "emanating from the local bakehouse" were also subjects of complaint.

"I have even heard of cases where shop assistants have suffered nervous breakdown because of the constant noise of the till keys being pressed and the draw being pushed back," a London medical officer of health stated. "Outside noises had obviously got the girls down and the constant noise of the till, like the drip of water, was the last straw."

Streamlined buttermaking

THE present trend in butter manufacture and packaging is to develop the continuous process so as to cut out the buildings and space normally needed, lower maintenance costs, and streamline everything from pasteurisation to packaging. A review of continuous butter-making processes by E. B. Rice was included in the May 1956 issue of our associate journal *Dairy Engineering*.

According to recent research, butter should be shaped and packed immediately after being worked, to obtain the highest keeping qualities. The packing machines should therefore be able to deal with butter that is still "warm." In order to obtain the finest possible distribution of the moisture in the butter and to avoid bacterial decomposition which would lead to quality deterioration, a number of research workers, particularly in Scandinavia, have suggested the use of mixers. In the latest continuous methods of butter packaging, the butter is pumped direct from a continuously working butter-making machine into an automatic butter-packaging machine. In *Fette-Seifen-Anstrichmittel* recently, J. Kalkeschmidt has discussed this trend and has traced the development of modern packaging methods, starting with the simple shaping machine. A great step forward was the introduction of the double worm conveyor shaping machine, where the butter is pressed through circular or oblong apertures in a continuous flow and cut by wires into the desired shape. The next step was to combine this machine with a wrapping machine, with an output of up to 3,000 packets per hr. A further important refinement was the automatic-weight-controlled packing machine which en-

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The Dairy Industry	The Boiler House
	Composition of Foods.

The Buyers' Guide has been completely revised and extended and includes directories of Plant and Equipment; Raw Materials; Packaging Materials; and Trade Names and Marks.

The book contains 1035 pages and costs 65s. net. A review will appear in our next issue. Meanwhile orders can now be placed with Leonard Hill (Books) Limited, Stratford House, Eden Street, London, N.W.1.

sures that each packet of butter has a weight accuracy within 0·2%. This machine has a maximum output of 3,300 packets per hr.

With the advent of continuous butter-making plant, it was also necessary to resort to new packing methods, especially for the wrapping of soft, unsalted cream butter. New machines designed for this purpose are directly combined with continuous butter-making plants. The continuous string of butter pressed forward by a worm conveyor passes through a dosing cylinder, where the desired volume of butter is pressed out by a piston through a tapping cock. On emerging from the tap, the butter is wrapped automatically in such a way that air inclusions are avoided. The output is up to 4,800 packets per hr.

Further research being carried out is intended to make the process even more hygienic and economic.

Mr. Sopp's strictures

"THE ART of container manufacturing is to make your tin or jar look bigger than all your rivals and yet at the same time to design it in such a way that it actually holds less," suggested a writer on packaging recently, and was indignantly quoted by the Berkshire chief inspector of weights and measures, Mr. C. C. Sopp, in his annual report.

Protesting against "deceptive containers," Mr. Sopp described them as ranging from "cunningly shaped jars and bottles to ordinarily rectanglar cartons which would hold up to twice the amount of food they actually contained. "While the correct weight of the contents invariably appears somewhere on the container, the average purchaser has been deluded into thinking that he or she is buying more than is actually received," he complained.

This state of affairs should be corrected, says Mr. Sopp, and he hopes that any new weights and measures legislation will "bring a degree of standardisation to pre-packaging."

For our part, perish the thought. Life is serious enough without a heavy hand being laid on those manufacturers and traders who seek to brighten shopping with a fancy pack or two and a pretty colour. So long as the correct weight or volume appears on the pack, as is legally required, no one is really being deceived. Mr. Sopp's complaint would have been justified a hundred years ago, but surely we have advanced somewhat in sophistication and literacy since then. If the shopping public think about over-size, pretentious packs at all they are more amused than angered.

Diet and eczema in infants

DR. MILTON HARTMAN of the Stanford University School of Medicine's allergy clinic has confirmed a view held by several skin specialists, namely that food is the most likely cause of eczema in babies. The American specialist characterises eczema as an allergic reaction to diet. Milk, eggs, and wheat products are the commonest causes of infantile eczema. Next on the suspect list come other cereals, orange juice, tomatoes, potatoes, peas, chocolate, spinach, nuts, fish. Beef may promote allergy in milk-sensitive babies; chicken may similarly be a promoter with egg-sensitive babies. Although one or two of these foods are unlikely to be included significantly in the diet of the very young, several are nevertheless likely to be given in some quantity.

Dr. Hartman said that although the first step in treating infantile eczema should be to remove from the diet any of these possibly allergic foods, this should only be done with medical advice, as an alternative diet must be nutritionally balanced.

A basic diet unlikely to cause allergic troubles could be composed of soya bean "milk," lamb, gelatin, rice, tapioca, bananas, peaches, apricots, apple purée, carrots, beets, beans, and a synthetic vitamin mixture. Other foods could gradually be added to this diet later.

Plantation foods

SUGAR, tea, coffee, cocoa and spices are known collectively as plantation crops, recalling the time when they were produced mostly on large estates overseas. The dominant position which these commodities hold in the export trade of a number of Commonwealth producers is shown by the Commonwealth Economic Committee in the 1956 edition of "Plantation Crops" (H.M.S.O., 5s. net). Cocoa accounts for three-quarters of the trade of the Gold Coast and tea two-thirds of that of Ceylon. Mauritius and Barbados depend almost entirely on sugar, which also represents about half the total shipments from Fiji and British Guiana. Coffee is responsible for between 20-30% of the trade of British East Africa.

Although plantation crops represent some of the major dollar-earners of the sterling area, Commonwealth cocoa has lost ground in the U.S.A. to French African and Latin American produce. Commonweath coffee also represents a very small proportion of U.S. requirements, although shipments from British East Africa are increasing. On the other hand over half of the large spice imports into the U.S. are from Commonwealth sources and while America drinks only one-fifth as much tea as Britain, the proportion drawn from the Commonwealth has risen to some three-quarters.

Tea consumption in the U.K. reached a peak figure of over 9·6 lb. per head in 1954; sugar consumption is increasing, the 1954 figure of 105 lb. per head comparing with 103 lb. before the war. Coffee consumption in the U.S. fell from 16·7 lb. per head in 1953 to 14·7 lb., largely because of the sharp rise in prices. High prices also limited the consumption of cocoa, the average disposals per head in the U.S. dropping to 4·1 lb. in 1954 compared with 4·3 lb. before the war.

However, these high prices for cocoa and coffee were not equalled in 1955, nor were the high 1954 prices for tea.

Silicone antifoam agents

FOAM in food manufacturing processes can be an expensive nuisance, and it is encouraging to hear of recent successes with silicone antifoam agents. Foaming during fermentation and brewing processes, the manufacture of gelatine, and evaporated milk products and bottle washing has been completely suppressed by the use of these agents, which are non-toxic and may be safely used with food. Usually only very small proportions are required—often as low as 1 or 2 parts of silicone per million parts of the foaming system.

Foams vary in their severity. For example, they may become severe if the liquid is being boiled or mechanically agitated. The problem of defoaming is to make the bubbles burst as soon as they form. This is best achieved by adding an insoluble material which on rising to the surface will break the film stabilising the foam. This type of antifoam agent must be immiscible with the liquid and the foam inducer. Silicone antifoam agents have all these properties.

The silicone agents are fundamentally different from organic antifoams. They are non-polar and do not associate with water or organic materials, both of which may be found in foaming systems.

Organic antifoams, on the other hand, are usually more soluble and act by retaining the impurity in the bulk of the liquid and away from the surface. This method is useful only if the impurity is a finely suspended solid. The organic antifoams are either naturally occurring or chemically synthesised compounds. They may be effective in some applications but completely useless in others. The action is very specific, as each foaming system requires a different antifoam agent which may be found only after long searching. Organic antifoams are generally required in relatively large amounts, whereas the quantity of silicone antifoam agent required is very small, the amount varying from 1 p.p.m. upwards, dependent on the identity and quantity of the foam-inducing agent and with the conditions producing the foam.

An informative summary of the uses of silicone antifoams has been published by I.C.I.'s Nobel Division.

Artful ad

FOR SHEER originality a full-page newspaper advertisement for Martini vermouth which recently appeared would be hard to beat. As they turned from the depressing headlines on the front page, readers came to what appeared to be an attractively laid out editorial page containing pictures, a gossip column, a leader, a crossword puzzle, a small cartoon and several other features. Every item was a subtly disguised advertisement for vermouth. Every celebrity mentioned in the gossip column was either drinking a Martini or offering one to somebody. Letters from "readers" recommended new recipes for cocktails, protested against closing hours, or related amusing experiences with wines abroad. To support the illusion of a real newspaper page, there were two ordinary display advertisements for Martini, one disguised as a cinema advertisement.

The advertisements were designed to imitate perfectly the pages of the newspapers in which they appeared, and these ranged from the *Manchester Guardian* to the *Daily Herald*. They are among the cleverest consumer advertisements we have seen and recall some of the best pre-war examples of the art.

Both spray and roller drying are used at Coleraine. Left: *The interior of one of Europe's largest spray driers.* Above: *Two of the five roller driers.*

MILK *into* POWDER

"Food Manufacture" visits the Cockade Plant at Coleraine

Milk powder production is increasing. In 1955 nearly 1 million cwt. was produced in Britain, double the pre-war total. To meet the demand, particularly from food manufacturers, Fisons Milk Products Ltd., have steadily developed their Ulster factory, which now handles some 12 million gal. of milk a year. A highly developed road-sea link provides rapid delivery to all parts of Britain.

AN OUTSTANDING feature of the post-war dairy industry is the very large rise in the manufacture and consumption of milk powder. In this country, production of all classes of milk powder rose from 478,000 cwt. in 1938 to nearly 1 million cwt. in 1955. Consumption (excluding powder used for animal feed) increased from 1·4 lb. per head before the war to 3·1 lb. per head in 1955, while exports jumped from 9,000 cwt. in 1938 to 63,000 cwt. in 1955.

Last year over 12 million gal. of milk were dried by Fisons Milk Products, Ltd., factory at Coleraine in Northern Ireland. Whole milk powder is primarily used for reconstitution into liquid milk and Fisons' *Cockade* milk powder forms a substantial part of National Dried Milk usage. It is also in demand from manufacturers of soups, chocolate, confectionery and ice cream, and other food products. Skimmed milk powder, also made by Fisons, is more popular for some food manufacturing purposes because it is cheaper. In many countries it is also added to bread. Skimmed milk powder is also in demand by international relief agencies as it can be reconstituted into a fat-free liquid milk. It is also used in the manufacture of animal foods.

Fisons' Coleraine factory—covering 14 acres and with a total floor area of 59,000 sq. ft.—was originally opened in 1946 by Bengers, Ltd., who wished to expand their interest in milk products because of their activities in the infant feeding field. Actually two factories were built, one for the production of dehydrated potato products, a line which was subsequently discontinued. This factory will be used to produce Fisons' newest product, a phage resistant medium. Coleraine was chosen as a site for the milk powder factory for several good reasons. It is in a large area of rich pasturelands where milk is

Part of the milk reception plant. Here the milk is pasteurised, brine-cooled and in the case of skim milk powder, separated.

produced in abundance and in which there is no similar factory. Communications are good: the factory is situated on the river Bann which is navigable and which also supplies cooling water for the plant, and Coleraine is connected to the large towns in Northern Ireland and Eire by road and rail, while there is daily ferry transport to Preston, also regular direct sailings from Coleraine to Liverpool. There is no labour shortage and in fact the establishment of the factory has greatly helped to solve Coleraine's own labour problems. About 240 men and women are employed, working in three 8-hr. shifts.

The factory continued to be run by Bengers until July, 1955, when it was taken over by a newly formed company, Fisons Milk Products, Ltd., a subsidiary of Genatosan, Ltd. Those factories primarily dealing in milk and milk products were brought together under the same management and the Coleraine factory was brought under Division 5 (Pharmaceutical and Milk Products) of which Genatosan, Ltd., is the parent body. Mr. William G. Proctor, the unit manager, was recently appointed to the board of Fisons Milk Products, Ltd.

Milk reception

Fisons handle 52,000 gal. of milk each day during peak production of *Cockade* roller and spray dried milk. The milk is bought from the Northern Ireland Milk Marketing Board, who are the sole vendors of liquid milk in Northern Ireland. Milk is collected daily from farms in an area allotted to the company by the board and is also drawn from the M.M.B.'s depots. These depots, which are butter-making creameries, also supply separated milk.

On arrival at the factory the milk is taken to one of two receiving docks, depending upon whether it is skim or whole milk, and is discharged. The 1,700 gal. stainless steel tankers are pumped empty through a hose connected to the processing plant, while the 10-gal. churns collected from private farms are passed along a roller conveyor to a weighbridge. Each churn passes a grader who takes off the lid and smells the contents of the churn. Any churn which does not pass the grader's preliminary olfactory test is taken off the conveyor for subsequent laboratory examination. The grading, formerly carried out by the Northern Ireland Ministry of Agriculture, is now done by Fisons, on the principle that the purchaser has the right to reject unfit goods. The Ministry of Agriculture, however, is still under a statutory obligation to make their own quality checks and Fisons, of course, make routine tests of samples for quality and fat content.

Milk that has been passed is tipped through the weighbridge and the churns are automatically conveyed through a churn washer to a live dock made up of roller conveyors and run off into the waiting lorries for return to the farms.

Fisons make three main products; roller dried milk which may be the full cream milk powder fortified with vitamins (National Dried Milk) or the commercial milk powder which is the same product without added vitamins; spray-dried full cream milk powder, and spray-dried separated

The entire plant is of stainless and vitreous enamel. The spray drier—the lower part and control panel of which is seen in this picture—produces a standard powder which has a solubility rating of 99%.

Preheaters and evaporators prolong storage life of the end product and prepare the milk for drying by two-stage condensing. ▼

▲ Here the final stage of condensing is carried out before the milk is dried. When fully dried, Cockade milk powder contains less than 3% of moisture.

milk (non-fat) powder. A certain amount of milk is also separated at Coleraine and the cream is used for butter manufacture.

Whether the milk is to be roller or spray dried, it is first pumped into 3,000-gal. glass-lined tanks fitted with agitators to await cooling. Milk which has arrived in tankers has already been brine cooled; farm milk is passed through three plate coolers and cooled to 40°F. The cooled milk is stored in a battery of fifteen 3,000-gal. insulated storage tanks.

All whole milk products are standardised by the addition of cream or skim milk to ensure that the fat content meets the varying specifications for the different classes of milk powder. Special orders for powders in both classes containing large and small amounts of fat are also executed.

Roller drying

The roller process of drying milk is still predominant in the U.K. and the bulk of whole milk powder supplies for infant and invalid foods consists of roller dried milk. The process is carried out by coating a steam-heated drum with the milk, revolving the drums and scraping off the dried material after a partial revolution has been completed. Milk is subjected to very considerable heat while on the rollers so that when the powder is produced it is absolutely sterile. Roller powder is very much coarser than spray dried, but it is not so hygroscopic and has slightly better keeping qualities.

Milk for roller drying is drawn from the insulated storage tanks and passed to calibrated holding tanks, where the necessary quantity of cream or skim milk is added to bring it to the required fat content.

Vitamins for National Dried Milk are added to and homogenised into a set quantity of milk which is then added to the bulk milk.

From the holding tanks the milk is passed through forced circulation tubular pre-heaters, where the temperatures are controlled to within very fine limits. Preheating milk before drying is necessary to destroy micro-organisms and enzymes and to control the physico-chemical condition of the milk constituents. The pre-heating temperature of the milk depends upon the customer's requirements but, unless specified otherwise, complies with the Milk Powder Manufacturers' standard Code of Practice. Certain trades claim that a low-heat gives special properties, while others prefer a high pre-heat temperature. The merits of the various heating temperatures have not as yet been fully evaluated, although it is known that pre-heating increases the resistance of the milk liquids to oxidation, brought about presumably by the antioxidant activity of sulphydryl compounds liberated from the serum proteins of the milk.

The pre-heated milk is fed into a forced circulation tubular evaporator with thermo-compression, which gives a very high degree of steam economy. The forced circulation unit gives a high velocity permitting greater evaporation per square foot while reducing scale formation and burning.

When the milk has been concentrated to the required solids content—usually 30%—it is fed to the steam-heated roller driers. There are 5 roller driers each having rollers 28-in. diameter and 80-in. long. The milk is sprayed on to the hot surface of the roller forming a thin film of dried milk, which is removed by a scraper knife after about three-quarters of a revolu-

tion of the roller. The sheets of roller dried milk are fed through a very fine mesh sifter, designed and made by Fisons' engineering department, and broken up into powder by a small propeller situated about ½-in. above the mesh. Scraper knives must be reground at fairly short intervals—about 100 hr, probably being the average time of satisfactory working between grindings—and great care is given by Fisons' engineering departments to the sharpening and maintenance of these knives and to their careful setting on the machines so that no part of the film of dried milk is carried round the roller for a second time. Fisons even grind roller knives for other milk powder factories in their district.

Spray drying

Spray drying is essentially a continuous process. It consists of drying milk in the form of a fine mist by means of hot air in a suitably designed chamber. Atomisation provides a very large surface area for the milk and evaporation is extremely rapid. The absorbed heat is so rapidly utilised that the temperature of the solids does not rise to that of the surroundings until the drying is practically complete, and the process does not generally affect the colloidal structure. Spray dried milk powder has a much greater bulk density than roller powder and the spherical form of the particles (roller dried milk consists of comparatively solid masses, irregular in shape and size, with little air enclosed inside the particles) tends to prevent caking.

For spray dried powder, milk is transferred from the storage tanks to calibrated holding tanks, and standardised, then pre-heated in forced circulation tubular preheaters and condensed in the same way as roller dried powder but to a higher solids content—usually 40%. After passing through the first forced circulation thermocompression evaporator it is passed through a similar but smaller finishing evaporator before it reaches the required concentration.

Pre-condensing milk is particularly important before spray drying, not only because of the considerable savings in fuel but because it reduces the entrapped air within the particle, thus resulting in increased bulk density, greater ease of reconstitution and improved keeping quality.

When this has been achieved it is pumped directly into the spray drier.

Fisons' spray drying plant is made entirely of stainless steel and is one of the largest in Europe. It produces a standard powder which has a solubility rating of 99%. The milk is fed into a rotary atomiser and is dispersed in the form of very fine droplets throughout the drying chamber. At the same time filtered hot air is diffused through the chamber, the milk drying almost instantaneously—theoretically concentrated milk becomes powder in $\frac{1}{40}$ th sec. Rotary powder dischargers remove the dry product continuously from the drying chamber, or to a vibrating powder conveyor and out of a discharge lock. Dry milk particles that are too fine to drop to the bottom are carried by the exhaust air and are trapped in dust collectors consisting of a series of filter bags. Each of the filter bags is automatically shaken at regular intervals and the powder discharged from them is mixed with the main bulk of powder travelling on the conveyor. All the powder then passes through a screen to the weighing and filling device. After passing through the filter bags the air is drawn up from the top floor of the factory and discharged to atmosphere from the roof.

Separated milk and butter

Whole milk destined for manufacture into spray dried skim powder is pumped directly from the storage tanks through a plate heater where it is brought up to separating temperature, and from here into a separator. The separated milk is returned to the plate heater and pasteurised by the High Temperature Short Time process and water and brine cooled. After cooling, the skim milk is pumped away to the insulated storage tanks for subsequent spray drying.

In the meantime the cream has been pumped away to the butter-making plant, where, after pasteurisation and brine cooling, it is stored in ageing vats and agitated until the next day when it is required for butter manufacture. Most of the butter is made in a large stainless steel churn, and all

Butter—ready for the Northern Ireland market. Churning of the cream is carried out under vacuum in one of the most modern all stainless steel churns with a one ton butter capacity.

The Cockade factory of Fisons Milk Products Ltd. is set in rich dairy pastureland in Northern Ireland and so receives daily supplies of perfectly fresh milk. The milk is pasteurised and refrigerated as soon as it arrives in the factory to maintain its purity and protect the natural vitamin and mineral content.

the butter made by Fisons at Coleraine is sold in Northern Ireland. Although Fisons do not yet make butter as a main line, the quality of their product is shown by the fact that the first time they exhibited this butter (in the Scottish Dairy Show) it won the second prize.

Packaging

Most spray dried milk is packed in polythene-lined cases or paper sacks. The powder is screened, weighed, and filled into these containers. The paper sacks are passed through stitching machines and the cartons heat-sealed.

A subsidiary packing department also operates for packing roller dried National Dried Milk into 20-oz. tins for the Ministry of Food. There also spray or roller dried powders are gas packed. The screened powder is filled by machine into grease-proof liners according to Ministry of Food specifications, check-weighed and inserted into the tin with an instruction leaflet. The tins are automatically lidded and taped, and every tin coded.

Phage-resistant medium

Fisons' *Cockade PRM*—phage resistant medium for cheese manufacturers—is the company's latest product. Production should be at the rate of 250 tons a year this spring and full production will be reached by 1958. The material is a white spray-dried powder to be reconstituted as a 10% (approx.) solution in distilled water for use. It is a calcium-free neutral medium produced from milk, and it is claimed that cheese-starter cultures grown in PRM will resist phage—the organisms which attack and destroy the acid-producing bacteria in cheese-starter cultures.

The risk of loss due to phage in any one year can be as high as 4-5% or between 30,000 and 100,000 tons of cheese in the 12 major cheese-producing countries alone in 1954. *Cockade PRM* will resist phage, it is claimed, in the following ways:

1. Phage will not multiply in PRM solution, and if initially present some of the phage will die out during incubation.

2. Many cheese-starter strains (or cultures)—different ones have been developed in different countries for different cheeses' production—will grow in PRM; and some grow better in PRM than milk.

3. Any starter culture that will grow in PRM will develop normally in spite of the heaviest phage contamination.

4. A concentration of phage that will cause complete lysis (disruption of cells) in cheese milk will not affect cheese-making if PRM-based cheese starter is used.

Laboratory control

Samples of liquid milk, milk during manufacture, and all finished goods are subjected to chemical and bacteriological analysis in the laboratory. Although a certain amount of development work is done at Coleraine, the main function of the laboratory is quality control. Research work is carried out at Loughborough. The standard tests—resazurin test, methylene blue, butterfat content, acidity, moisture, etc.—are carried out at Coleraine.

Distribution

Teleprinter communication has been established between the sales office in Loughborough and the factory in Coleraine, and Fisons claim that orders placed can be delivered within a week. They say that delivery of milk powder is as quick from Coleraine as from any part of the U.K. because of the excellent ferry facilities across the Irish Channel and the teleprinter service. Trailers are loaded with milk powder at Coleraine, hitched on to tractors and driven on to the ferries. The tractors are then unhitched and backed off. On arrival at Preston, tractors are hitched on to the trailers and the milk powder is driven off to its destination.

Deliveries of milk powder to schools in Northern Ireland are also made under the Northern Ireland school meals scheme.

SOME SUPPLIERS OF EQUIPMENT

Weighbridge: *W. and T. Avery, Ltd.*
Churn washer: *Wright, Hargreaves Engineering Co., Ltd.*
Holding tanks: *Enamelled Metal Products Corporation (1933), Limited.*
Heat exchangers: *A.P.V. Co., Ltd.*
Separators: *Alfa-Laval Co., Ltd.*
Evaporators; spray drier: *George Scott and Son (London), Ltd.*
Air filter unit: *Visco Engineering Co., Ltd.*
Ageing vats: *A. Johnson and Co., Ltd.*
Filling machines: *Geo. Driver and Son, Ltd.*
Roller driers: *Bertrams, Ltd.*

MILK AND MECHANISATION

A high degree of mechanisation and automatic control is essential in the dairy industry because of the huge volumes of sensitive raw material which have to be handled hygienically, speedily, precisely and economically. Here are some recent developments in engineering for the dairy industry.

Fifty Gallons a Minute

The Desco curd pump is a slow speed positive twin rotary pump of sanitary design, and stainless steel construction. It is a mobile assembly for connection to cheese vats to dispense curd into draining cloths for the manufacture of soft cheeses.

A novel feature of the pump is the hand-piece which is attached to a length of transparent plastic hosing. This incorporates a simple but effective pneumatic switch control connected to the motor contactor starter by a length of small diameter rubber tubing. This system relieves the hand-piece of any electrical connections (with their attendant dangers) and allows its complete removal for cleaning purposes.

When in operation it is claimed that the pump is capable of emptying the curd contents of a 500 gal. cheese vat in approximately 10 min. A substantial saving of man hours and labour cost is thus effected.

Top of page: **Mobile pump for connection to cheese vats; a 500-gal. vat can be emptied in approx. 10 min.**

Above: **Stainless steel, general purpose process vat available in five sizes, from 50 to 500 gal.**

Right: **Straight-through type bottle washing machine. The range of models provide capacities of 6,000 to 16,000 bottles per hr.**

High-speed Washing and Handling

Capacities of from 6,000 to 16,000 bottles per hr. are available with the new range of bottle washing machines manufactured by Dawson Bros. The machines are of the straight-through type, the bottles being loaded at one end, receiving treatment whilst passing through, and being discharged automatically at the other. Although the standard design is for pint size bottles, the machines can be constructed to take bottles up to quart or litre size.

The bottles pass through six different stages. They are given preliminary external and internal rinses, two detergent washes in temperatures from 125°F. to 160°F., two warm rinses and a final cold rinse to bring them to a satisfactory temperature for filling. During the treatment they are held by nylon cups—a new fitment—to prevent loading shocks.

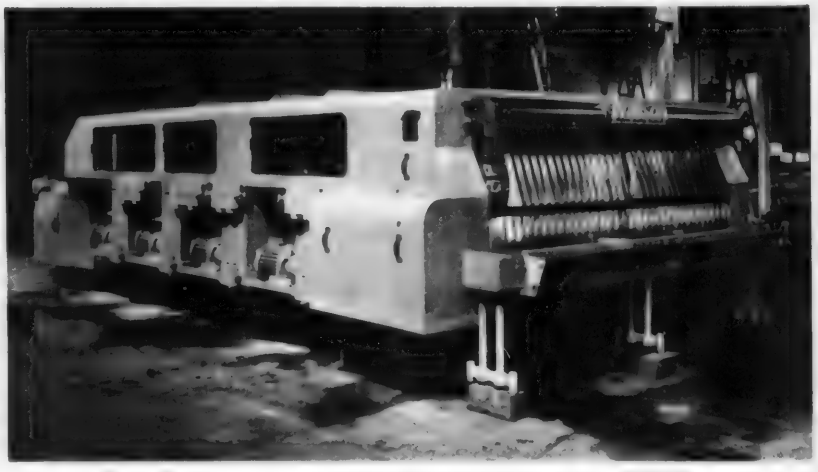
A self-contained drive complete with variable speed unit, air-operated clutch and Geneva gear box, provides intermittent motion to the conveyor chain, giving accurate centring of the bottles over the jets. The air-operated clutch allows the provision of several safeguards. In addition to the stop valve at the feed end there is an automatic stop valve operated by the discharge cradle should proper functioning be prevented. A master control valve is positioned at the discharge and the machines can only be started at this point. All the pumps are of identical size and power, being interchangeable to facilitate maintenance. Tank temperatures are automatically controlled by thermostatic valve units to ±2°F. of their set temperatures. The large window areas give clear observation and access to jetting sections.

Dawsons also supply a crate washing machine in which the crates are sprayed from all angles with water at a temperature of 180°F. Leaving the machine the crates are given a final rinse with cold water.

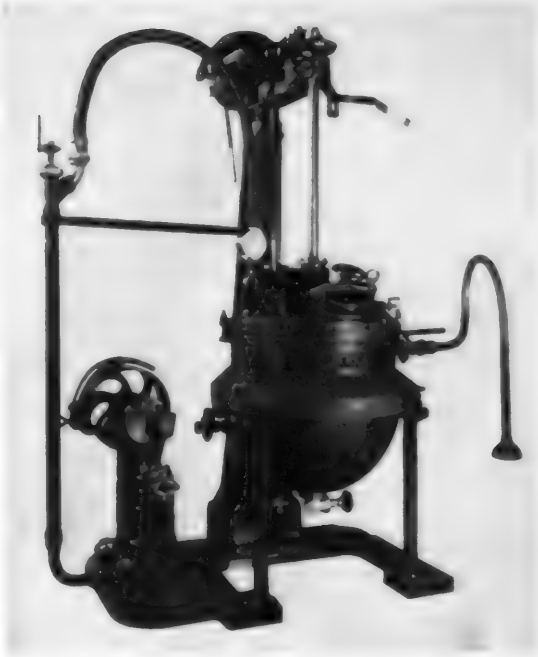
Removing the bottles from the crates, taking them to be washed and filled and returning them to the crates can also be done mechanically with the decrating and recrating machines and bottle conveyors supplied by Dawsons.

Stainless Process Vat

The range of APV stainless steel general purpose process vats has been re-designed and extended and now meets the needs of most batch heating



Left: **This close-up shows the unusual design of the "Impelator" mixing head.**



Right: **Vertical mixer with vacuum pan for condensed milk manufacture.**

and cooling processes in the milk, ice cream and liquid food industries.

The vat consists of an inner stainless steel vessel separated from a surrounding insulated jacket and stainless steel outer casing by an annular space. At the top of this annular space in a spray ring for cooling and a steam connection for heating. Temperature is controlled by an automatic steam valve actuated by a thermo-bulb in the product. Thermometers and temperature recorders or recorder controllers are supplied as required. Alternative types of electrically driven agitators can be supplied either bridge or brim mounted.

The vats are made in 50, 100, 200, 300 and 500 gal. sizes which meet such requirements as the batch pasteurisation of milk, cream and ice cream mix, aging cream and ice cream mix, reconstitution of milk powder, processing of Yoghourt and other fermented milk products, preparation of flavoured milk drinks and the batch pasteurisation of fruit juice concentrates.

New Mixing Principle

The *Impelator* is an entirely new design of mixing machine produced by Plenty and Son, Ltd., and already dairy firms are interested in it. It is designed not only to set in motion the media to be mixed but to combine centrifugal force, suction and shearing action and counter current whirl. It is claimed that this combination, while creating an efficient intense mixing zone, also promotes a very high velocity of flow through the entire vessel, ensuring maximum dispersion with minimum particle size.

The machine consists of a number of small conical tubes mounted round the periphery of two discs. One set is fitted to the bottom of a vertical rotation shaft. Above this set, adjustable up or down the same shaft, is assembled a second set. Others are added according to the height of the mixing vessel. The conical tubes are set at such an angle that controlled turbulence in an upward and downward direction is created.

The liquid or mixture of liquid and solid, which is passed through the tubes during rotation, impinges on the already moving bulk of the mass which produces a rapid shearing action between the particles of each of the materials. This is claimed to achieve a well dispersed and homogeneous mixture of minute particle size.

Filling and Capping 12,000 Bottles an hour

It is claimed that the VSS. 30/8 bottle filling and aluminium capping machine manufactured by the U.D. Engineering Co., Ltd., will fill and cap virtually every type of pasteurised milk bottle at speeds of up to 12,000 per hr. Designed to maintain a smooth single plane movement of bottles throughout the entire process cycle, the integral conveyor of these machines is constructed from stainless slats linked by roller chain segments and supported upon replaceable bearings. Bottles flow in a continuous stream through the machine without relative movement between conveyor and bottle, so reducing wear to an absolute minimum. A worm feed synchronised with the infeed star wheel absorbs any shock arising from high input speeds.

The integral cap making press is said to produce 200 perfectly formed caps per min. from plain or synchro-print foil of all thicknesses now used. Powered feed and re-wind equipment ensures smooth operation and permits speedy foil changes.

A two-stage centrifugal exhauster unit, which maintains a constant degree of vacuum in the filling bowl, provides a vacuum controlled filling mechanism which eliminates waste and ensures consistently accurate filling levels, irrespective of feed or load. To facilitate rapid change-over of bottle sizes all three operating heads are synchronised with powered height adjustment equipment.

The company also supply a crating machine which forms an extension of the filled bottle conveyor. It is designed for a wide range of crates and bottles and will function continuously.

One of the VSS. 30/8 machines is now being installed at the dairy of the Belfast Co-operative Society, Ltd., where plant is being re-planned and extended to provide five bottling lines with a handling capacity of over 50,000 pint bottles per hr.

Condensed Milk Manufacture

For small-scale production of condensed milk, William Brierley, Collier and Hartley, Ltd., make a vertical mixer with vacuum pan. The sugar and glucose are first dissolved in a batch of milk in a pre-heating pan, then drawn into the vacuum pan. After allowing the foam to settle, the steam is gradually turned on up to 60 p.s.i. The mixer is then run on for a few minutes, the steam is cut off, cold water circulated and the vacuum stopped. The stirrers are usually left running while the condensed milk is discharged. The usual size of the batch is 200 litres milk, 50 kg. sugar and 10 kg. glucose.

Dairy Products

By A. W. Marsden, M.Sc., D.I.C., A.R.C.S., F.R.I.C.*

Frozen, concentrated and instant milk ★ Buttermaking ★ Cheesemaking ★ Radiation Preservation

MILK PRODUCTION and its manufacture into various dairy products continues to be a big section of the world's agricultural and food industries. In 1956 the estimated total production of milk in the United Kingdom alone was 2,470 million gal., which is nearly 40% more than in 1938. New and improved methods of producing, processing, distributing and marketing these dairy products are constantly being sought.

Frozen milk

Because milk is such a perishable commodity, many processes have been devised for treating or modifying it to ensure longer keeping qualities and greater ease in storing and transporting it. In recent years the possibility of freezing whole milk rapidly and keeping it in frozen storage until required has been explored. It has been used on a commercial scale in several countries, but difficulties have often been encountered because, when thawed out, the milk had acquired taints or the butterfat had separated to some extent. The method recently devised at the National Institute for Research in Dairying, for which a patent has been applied, seems to have overcome these difficulties. It is frozen in plastic bags of various sizes and has been used successfully as a source of fresh milk in liners on long voyages.

In Italy[1] it is claimed that if 20-kg. blocks of milk frozen at −20°C. were transported in insulated railway wagons, the temperature should not rise above −5°C. in 48 hr. and the method would be useful for supplying milk to distant markets. It is doubtful, however, if the cost of this process would warrant it for the liquid milk market under normal circumstances.

The stability of frozen milks has been studied in detail by Rose and his colleagues.[2] They found that the degree of preheating and of prefreezing storage had a marked influence on the frozen milk, especially on lactose crystallisation and protein precipitation. Added sugars and glycerol increased the stability by retaining water in the unfrozen state and thus preventing the concentration of soluble salts and the fall in *p*H associated with the precipitation of basic phosphate.

Concentrated milk

To prolong its keeping qualities and to save storage space, milk has for many years been evaporated, condensed (usually with added sugar) or dried. More recently a low-temperature evaporated milk—known as "concentrated milk"—has been on the American market. Calbert *et al.*[3] describe a process for making it in which whole milk is heated to 170°F., homogenised and heated to 270°F. for 3 sec. in an ultra-high-temperature tubular heat exchanger before being cooled to, and evaporated at, 100°-110°F. The product is then standardised with sterile water to 36·1% total solids, preheated to 140°-145°F., again heated in the U.H.T. heat exchanger at 220°F. for 3 sec., cooled rapidly to 45°F. and canned aseptically. It is said to keep well at 45°F. for 6 weeks.

This product, packed either in fibre cartons or in cans, was distributed to a large number of families to determine the consumer's acceptance of it. Cook *et al.*[4] state that 50% of the concentrated milk was used for drinking purposes (after dilution) and the remainder undiluted in cooking, coffee and on cereals and fruit (as a substitute for thin cream). On the assumption that fresh milk was 20 cents per quart and the concentrate 18 cents (equivalent) per quart, over 50% of the housewives stated that they would wholly substitute the concentrate for liquid milk. With the concentrate at 20 cents (equivalent) per quart, the figure was 34% of the housewives.

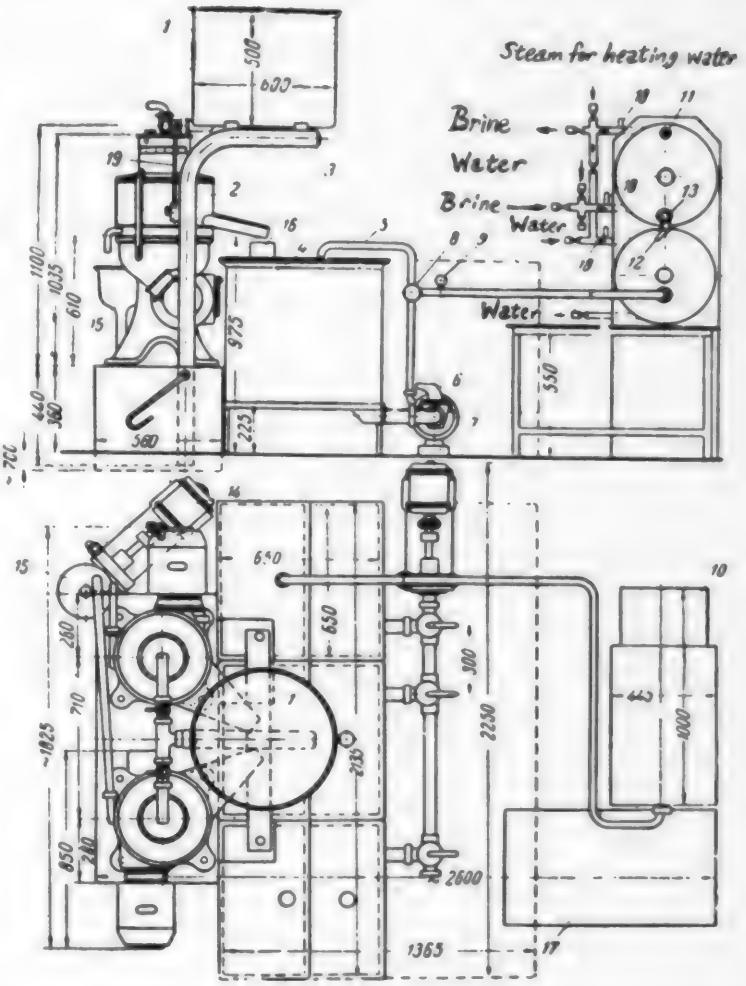
In a report issued by Utter *et al.*,[5] details are also given for preparing a 3 : 1 concentrated milk as well as particulars of the manufacturing costs in different types of plant. In this case grade A milk with 3·5% butterfat was pasteurised at 180°F. for 16 sec., homogenised and cooled to 125°-130°F., at which temperature it was concentrated to one-third of its volume. It was again pasteurised at 180°F. for 20-25 sec. and rapidly cooled to 40°F. before being adjusted to 10·5% butterfat by adding pasteurised water. This product stored well at 35°F. for a month, at 40°F. for two weeks but only for 2 days at 50°F.

* Commonwealth Bureau of Dairy Science and Technology.

Automation in Russian Buttermaking Process

A buttermaking process developed in the U.S.S.R. by V. A. Meleshin and others is claimed to save 26% in production costs, taking only about one-third of the usual requirement of man-hours. It is also said to yield a better quality product, partly at least because of finer moisture dispersion.

Cream from the separators is fed to a tank and thence by centrifugal pump to a pasteuriser. From here it is passed to a butter separator, from which the cream is received by a two-walled vessel, where it is standardised and cooled. A supplementary vessel may also be filled. The cream, cooled to 40°C., is pumped into a butter cooler and, by cooling and mechanical working, converted into butter. On removal it is kept at a temperature of 15-16°C.



Arrangement of Meleshin plant: (1) receiving tank; (2) separator, using 7·8-2 kw.; (3) tank support; (4) tank for high-fat cream; (5) return pipe; (6) stop-cock of 50 mm. dia.; (7) pump for high-fat cream (0·7 kw.); (8) three-way cock, 36 mm. dia.; (9) manometer; (10) cooler/butter-former (1·8-2 kw.); (11) air outlet valve; (12) swivel connector; (13) cock controlling butter flow; (14) pump for butter-milk (Russian (*pakht*) (0·5 kw.); (15) receiving funnel for butter-milk; (16) distributing box; (17) tables for boxes or containers; (18) thermometer; (19) valve rod or support.

A frozen, concentrated milk was reported by Nielsen *et al.*,[6] also in the U.S.A., which was canned and had good keeping qualities when stored for over 3 months at −20°F.

With the increasing costs of hauling milk to depots and of distributing it to households every day, it seems not unlikely that some form of concentrated milk may in part replace whole milk for domestic consumption.

Instant milk

The interest in instantly soluble, spray-dried skim-milk continues to be maintained. The inventors of the various processes in the U.S.A. have now disclosed some further manufacturing details. Peebles[7] has published a schematic drawing of his process, in which ordinary spray-dried skim-milk powder comes into intimate contact with finely atomised water and air fully saturated with steam. The "conditioned" powder then falls through a counter-current flow of cool air on to a conveyor belt and to a shaker-dryer, where its moisture content is lowered to 3·4-4% by forcing heated air through a moving bed of the powder.

Myrick[8] has given flow diagrams and some manufacturing details of the Cherry-Burrell and Blaw-Knox processes, and Carlson *et al*[9] report further details of the former method. All these methods consist of a two-stage process, (*i*) moistening the spray-dried powder and making it slightly adhesive, (*ii*) drying the agglomerates and sifting the final product.

Instant milk samples were examined by Starey[10], who found that the lactose present appeared to be incompletely hydrated.

The nutritive value of instant milk is comparable with that of fresh, pasteurised skim-milk or low-heat dried skim-milk. Hodson[11] found there was no loss of vitamins (except ascorbic acid) or lowering of the protein quality by subjecting milk to the "instantising" process.

Buttermaking

Much thought is being given to simplifying the buttermaking process and the equipment used.

Several continuous processes have been devised, although none has yet been used on a very large scale, but many modifications of and additions to the conventional butter churns have been put forward. For example, Naveau[12] describes a churn in which the interior of the barrel is provided with elements through which hot or cold water may be circulated to effect pasteurisation of the cream and subsequent cooling. The water inlet and outlet passages are concentrically situated in the shaft. Pasteurisation and ripening of the cream, churning and working are all done in the churn itself.

Rollerless butter churns have been reported by Zeuthen[13] and by Könnecker *et al.*[14] which have beaters of various designs incorporated. A Swedish stainless steel churn has also been described and tested[15] which has nine different speeds on a horizontal axis. Most of these and other new types of churns are made to work under reduced pressure during the final stages of working the butter.

The emptying of large butter churns on to butter trolleys and tables and its subsequent packing into casks is a laborious task in a creamery. Hansen[16] describes a system in which a stainless steel rotary gear pump connected to one of the apexes of a conical stainless steel churn has been used successfully for pumping butter from the churn to the cask. A temperature of 16°C. in the winter and 14°-15°C. in the summer was found suitable. By this means the butter need not be fully worked in the churn as the final working takes place during the pumping. It takes about 30 sec. to fill a cask and no difficulty was foreseen in pumping butter to a printing and wrapping machine.

Such a pump has been used in Germany and is described by Dähne[17] with butter from a double-cone churn. A Danish report[18] confirmed that this procedure was successful between 13·4° and 18·5°C., and scores for consistency were satisfactory for all samples. Loose moisture was reduced during pumping and no air was incorporated. The keeping quality of "pumped" butter and that for the same batch of butter, which was fully worked in the churn and removed by the conventional method, showed no differences.

Cheesemaking

Probably the greatest interest nowadays is in shortening the time necessary to make cheese and in mechanising the process as much as possible. The recent introduction of *Streptococcus durans* in the starter, with its higher resistance to salt and temperature than the usual cheese starter organisms, has been a great step forward. After two years' trial of this method in Australian commercial cheese factories, the "short-time" cheese was found to have graded very well.[19] Some defects due to insufficient acidity development have been overcome by using a larger inoculum of the *Str. durans* culture or, more recently, by using a faster acid-producing strain of *Str. thermophilus* in place of *Str. durans*.

Czulak *et al.*[20] have also brought out a curd-fusing machine which it is hoped will shorten and mechanise still further the cheesemaking process. Meanwhile, Walter *et al.* in the U.S.A.[21] have modified their original short-time process so that conventional equipment can be used.

It is impossible to mention all the mechanical systems of cheesemaking that have been reported during the last year, and it is quite likely that many may never reach the production lines. Hensgen *et al.*[22] report a piece of equipment for continuous cheese manufacture in which there are two series of movable rotating vats attached to a central support, one with the milk and the other with the curd. The whey is partly centrifuged out of the curd which is automatically filled into hoops.

Nilsson[23] describes the mechanisation of the Emmental process in Finland and Selivanov reports a system of cheesemaking in Russia[24] in which small quantities of milk—about 25 gal.—are coagulated in vats and the curd-whey mixture then passes into radially placed containers, rather like a bottling machine, where the whey is drained off. The moulds are filled underneath and pass to another radial machine for pressing.

Coating and packaging cheese

With the advent of the self-service food shop, with its many yards of shelf space and refrigerated counters, there has been a big increase in the number of attractively wrapped foodstuffs. Irvine[25] has surveyed the progress in packaging cheese during the post-war years and listed many types of flexible films and foils, wax and similar coatings and various mould-prevention substances for treating the surface of cheeses.

Mineral oils as a coating for natural cheeses are now forbidden in many countries and edible vegetable oils or waxes must be used; but these sometimes present difficulties because of off-flavours which may develop in the cheese after ripening and storage. Interest is now being taken in incorporating a fungistatic material in the coating. Sorbic acid has proved fairly successful but it is not as cheap as some other substances and substitutes for it continue to be sought. Furthermore, by a suitable treatment of the cheese coat and/or wrapping the cheese in a plastic film, it is hoped that there will be less rind wastage in the mature cheese and hence a greater edible proportion.

Irradiation

A very comprehensive report by Hannan[26] discusses the possibilities of irradiating various foodstuffs. As far as milk and dairy products are concerned, the author states that "the intensity of the flavours developed, and the complexity of the methods required to control them, are likely to preclude complete sterilisation on a commercial scale unless some radical new departure in technique is developed."

Proctor and his colleagues in the U.S.A.[27] have

(*Turn to page* 64)

Meat

By Frank Gerrard, M.Inst.M., M.Inst.R., M.R.S.H.*

Supplies and prices ★ Dominion and Argentine trade ★ Research committee ★ Antibiotics ★ Pre-packaging ★ CO_2 anæsthetising ★ Grinder developments

LAST YEAR was one of stabilisation and consolidation, following the unsettled consumer demand which continued for some considerable period, following the de-control of meat and meat products.

Although the final figures are not yet available, it would appear that total meat consumption in Great Britain is slightly higher than that of pre-war years, which was about 110 lb. per head per annum (edible weight). It still lags behind the United States by about 50 lb. per head and is some 15 lb. per head behind France. It seems likely that meat consumption, particularly beef, will stand a good chance of increasing steadily for some years, and efficient home production could contribute materially to this increase.

United Kingdom livestock

The cattle census at June 1956 showed an increase on the previous year of 2% and much of this increase was in cows and heifers to be kept for beef. The increased numbers in younger age groups indicates a continued increase in beef production. In the case of sheep, the upward trend continued, but the total figure is still 3 million below that of 1939. The number of sheep over one year old declined, reflecting the public demand for smaller, leaner joints, fewer hoggets being retained for mutton.

Pig numbers have dropped and were some 12% below the record figure of 1954. There is little doubt that the final slaughter figures for the year will show a considerable decline.

Poultry figures were higher than in 1955, with a remarkable increase in turkey production of over 65%. This increase depressed prices at the Christmas markets.

Owing to the competition of Russian and German cattle buyers in Denmark, the Dutch buyers have been purchasing lean cow beef on the hoof from producers in Great Britain. In addition, a number of similar animals have recently been shipped from this country to France. The development of this trade might help considerably in dealing with the seasonal autumn glut and might prove to be a useful outlet for this class of animal.

Generally, there has been a real effort by the producer to meet the butchers' requirements for a good quality leaner beef, from younger, lighter weight cattle. This trend was particularly evident at the Christmas fatstock shows. At the Smithfield Show it was difficult to find a really overfat beef carcase. In the near future we may follow the American lead of performance testing for beef, where calves are reared from an early age under similar feeding and management. Work is now being carried out in this country on the effect of implanting stilbœstrol pellets in the ears of fattening cattle, which results in an appreciable saving in feed and tends to give an increase in muscle rather than fat.

A new preparation of fatty acid derivatives and other chemicals is being offered by Armour and Co. for stimulating the growth of ruminants. Defined as a " chemobiotic " and marketed as *Dynafac*, feeding tests have given weight increases of between 10-15% in the case of cattle and sheep, when added at the rate of 1 lb. per ton of feed. It is also claimed to be effective in preventing scour in pigs.

Dominion trade

New Zealand meat production is still expanding and it is probable that the figures for 1955-56 will be between 660,000 and 665,000 tons. Export meat has increased nearly 20% in two years, and in spite of the decrease in prices the meat industry's contribution to the New Zealand overseas exchange should reach record figures for this year. The New Zealand sheep population is the highest ever recorded, the number of breeding ewes exceeding 26 million.

An ambitious scheme to develop an island site in Bluff Harbour, Southland is now going ahead at a cost of nearly £5 million. This 110 acre site, when fully developed with refrigerated meat stores and wharves, might well become the most important meat export port in New Zealand. The plan aims at suffi-

* National College of Food Technology.

cient storage on the upper floor to accommodate two complete shiploads of meat which can be transferred direct to the hold by automatic meat loaders. There should therefore be no delays due to weather and waggon shortage.

The most interesting development of recent years in the Australian export trade has been the increase in canned meats, which apparently has developed from meat rationing days. Changes in domestic conditions and de-control has not resulted, as one might expect, in a rapid change-over to carcase meat. This trend is also evident in both Canada and the United States, the demand for canned meats remaining fairly firm, in spite of the availability of other meat supplies. It seems probable that during the year the Australian income from the export of canned meats might well exceed that obtained from the export of carcase beef.

Argentina

It is estimated that for the first time cattle slaughter in Argentina will have exceeded 10 million head. This was expected to provide about 550,000 metric tons of beef for export, leaving approximately 1·75 million tons for domestic consumption. Of the former figure about half will represent exports of chilled beef to the United Kingdom. This is roughly an increase of 150% on the previous year.

If we take the Smithfield (London) values as an index, these heavy supplies have played an important part in depressing the price of all beef supplies, particularly during our own peak killing season in the autumn and early winter.

The following prices from Smithfield during the week ending Friday, November 2, as compared with the same week in 1955, illustrates the effect of the increased supplies from the Argentine:

	1955		1956	
	s.	*d.*	*s.*	*d.*
Scotch Sides beef	2	3	1	10½
English Sides beef	1	11	1	6
Argentine Sides beef	1	6	1	3½

Research and investigation

During the year it was appreciated that an effort should be made to co-ordinate the work which is being carried out in a number of individual units in various parts of the country. With this object in view the Government has appointed a Technical Advisory Committee on Meat Research. Its members are drawn from producers, scientists, butchers and meat experts, while the consumer is also represented.

The function of this committee is to advise the Minister on problems associated with the production of livestock and its conversion into meat and meat products. In addition it will also advise on the various technical developments necessary, in order to investigate such problems. There is little doubt that this policy could do a great deal to improve the efficiency of the meat industry and assist in streamlining present methods of distribution.

United Kingdom Livestock.

CATTLE

	1939	1955	1956*
		Thousands	
Cows and heifers	3,885	4,489	4,672
Bulls and bull calves	157	124	123
Other cattle:			
2 years and over	1,299	1,562	1,546
1 to 2 years	1,867	2,226	2,567
Under 1 year	1,736	2,268	2,316
Corrected Totals	8,872	10,668	10,915

*Provisional

SHEEP

	1939	1955	1956*
		Thousands	
Ewes for breeding	11,292	9,202	9,587
Other sheep:			
1 year and over	3,494	3,969	3,543
Under 1 year	12,102	9,779	10,478
Corrected Totals	26,887	22,949	23,607

*Provisional

PIGS

	1939	1955	1956*
		Thousands	
Gilts in pig— ... ... Sows —	542	89 594	135 561
Pigs 5 months and over	801	1,191	1,115
2–5 months	1,872	2,499	2,321
Under 2 months	1,179	1,471	1,389
Corrected Totals	4,394	5,843	5,522

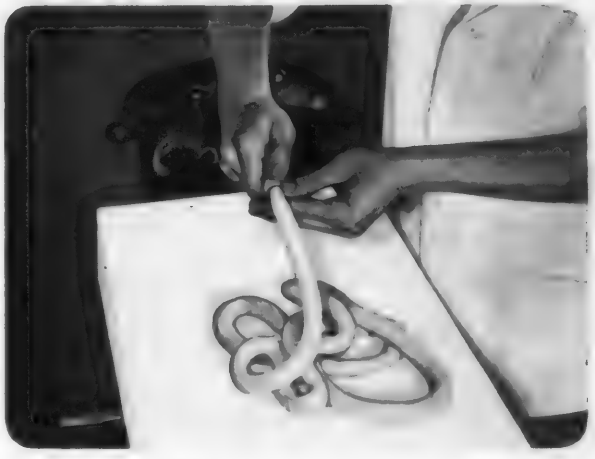
*Provisional

Antibiotic preservation

The work carried out in the United States by Deatherage and his co-workers into the use of antibiotics has been supplemented by investigations in this country, with particular emphasis on aureomycin, as a means of preserving meat and meat products. Under our preservative regulations their use would not be permitted here. Various forms of beef treatment have been investigated. Surface spraying, injection through the arterial system, both anti- and post-mortem, and combinations of these methods, have been examined. In a recent technical bulletin prepared by Dr. John Taylor and published by Cyanamid Products Ltd., of London, the author states:

"Treatment of meat with chlortetracycline* in no way impairs the quality of the product, and indeed there is evidence to suggest that it may allow more adequate tenderisation. The process of tenderisation develops more rapidly at room temperature than at refrigeration temperature and the ability to hold beef at room temperature for 48 hr. and then chilled may considerably assist in the normal maturing of meat under commercial conditions. In assessing the tenderness of infused beef it has been observed that loin steaks held at room temperatures for 48 hr. and then

* This antibiotic is produced by the growth of the organism Streptomyces aureofaciens and shows potent activity against a wide range of bacteria. It does not inhibit the growth of yeasts and moulds.



"How To Make a Quality Sausage"

This is the title of the first film made by the Institute of Meat. It is a 16 mm. production in sound and colour with a running time of about 25 min., and is available on loan free to all organisations wishing to see it. "Star" of the film is Mr. J. Fisher of John Crampton, Ltd., who also provided technical advice. John Crampton have prepared a booklet with the same title and on the same subject which will be distributed at showings.

Top (left) *shows the correct ratio of fat to lean.* **Right:** *Sprinkling seasoners and improvers over the lean meat.* **Opposite:** *Filling the skins.*

chilled were as tender after 5 days as were those which had been immediately chilled and stored for a period of 2 weeks. Thus the possibility of improving the quality of meat as a result of antibiotic treatment appears encouraging. Preliminary work in this country indicated that 25 p.p.m. of the antibiotic in ground beef held at 10°C. retarded decomposition and added several days to its storage life. The value of this substance has been assessed in the manufacture of pork sausages. The antibiotic was incorporated at the rate of 2 p.p.m. in the presence and absence of heated spices. Results indicated that at 5°C. the sausage meat treated with chlortetracycline could be stored for 13 days, whereas similar untreated material was putrid after 7 days."

Work has also been carried out on poultry, and where the practice of cooling eviscerated poultry in ice water is followed the inclusion of 10 p.p.m. in the cooling water can increase significantly the subsequent storage life of the birds.

It would appear probable that the inclusion of antibiotics in brine solutions for hams might well prove to be a valuable field of investigation.

An excellent first-hand review of American experience with antibiotic preservatives appeared in the December 1956 issue of FOOD MANUFACTURE (pp. 508-510).

Pre-packaged meats

The retail trade in pre-packaged meats has developed considerably, particularly in those areas of heavy population and where the housewife goes out to work. There is little doubt that this trade will develop considerably as the domestic refrigerator becomes more widely used. It is a sign of the times that a number of the wholesale meat firms are now importing meat cuts and even chops, with an eye on the possible development of this type of trade. One of the chief difficulties with the pre-packaging of meats is the disposal of the so-called inferior cuts. In the absence of a factory dealing with prepared meats, which could utilise such portions, the problem can be a serious matter. We do not seem to be alone in this difficulty, and one American organisation has tackled this problem by treating the tougher portions with an enzyme tenderiser before wrapping. Quick freezing stops the enzyme action, but it again commences on thawing, therefore the consumer must be educated to use such meats as soon as they are defrosted.

Anæsthetising pigs

The use of CO_2 gas for rendering pigs unconscious prior to sticking is of American origin, but more recently Werner, a Danish engineer, has adapted this

principle for use in bacon factories. A typical unit now employed at Zwanenbergs' factory at Oss in Holland is capable of dealing with 240 pigs per hr. and a throughput of 1,800 pigs has been achieved in a day. With this method the muscles remain flaccid, there is less possibility of errors in sticking, bleeding is more efficient and the keeping qualities of the resultant carcase are improved. In addition to the humane aspects of this system, a speedier and consistent production flow is obtained.

Sausage production

Bowl cutter design, in the case of larger models, has tended towards a machine which will eliminate pre-mincing of the meat. This has been brought about by a higher knife shaft speed, in some cases incorporating a gearbox to provide alternative speeds. On some patterns it is possible to control automatically the number of bowl revolutions per batch to ensure standard production. Considerable attention has been given to "heating up" during chopping, with especial reference to the design of the knife cover, and many meat product firms are changing their technique to include ice water in the mix to offset temperature increase.

Meat grinders

An interesting development is a meat grinder capable of dealing with food ingredients in a dry, wet or frozen condition. It can be used for raw rinds, gristles, head meat, including ears, and cooked by-products. The resultant product has a superfine texture similar to that of a fine paste. In the preparation of meat for cooked sausage and similar products there is always present, particularly in veal, sinews and gristles which cannot be removed in the normal way. Such material will show up on cut surfaces where normal chopping is employed. Meats prepared on this grinder have an homogeneous smooth texture and can be stuffed more firmly, thus being particularly suitable for sliced packaged cooked meats and sausage.

It has also been found useful in hospitals and institutions for grinding down veal bones for soup.

Dairy Products

(*Concluded from page 60*)

studied the radiation preservation of milk and dairy products and have found that off-flavours could generally be recognised after doses of 7,000-25,000 rep. Homogenisation and increases in moisture and fat contents all gave increased flavour development.

Day *et al.*[28] have isolated some of the volatile compounds responsible for off-flavours in milk after it has been irradiated, but by no means all the products have been identified. Metta *et al.*[29] have shown that rats fed irradiated evaporated milk ate more reluctantly than those given the untreated milk. Although no difference could be detected in the true digestibility of the proteins, the biological value was decreased, possibly due to the destruction or the binding of certain essential amino acids.

Many dairy scientists and food technologists are engaged in studying the effect of ionising radiations on milk and dairy products. It is obviously a field which must be explored in this age of nuclear power but—at present—it does not seem to be a method which will be useful for treating foodstuffs in the near future.

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Assessment of Cheese Quality

PHYSICS undoubtedly has a part to play in the dairy industry, as instanced by the recent discovery at the National Institute for Research in Dairying that the electrical conductivity of butter can be used as a guide to its keeping qualities (see *Dairy Engineering*, 1956, **73** (2), 33).

This example was recalled by Dr. G. W. Scott Blair, head of the Department of Physics at the N.I.R.D., in a paper presented to a meeting of the Society of Dairy Technology in London on Jan. 8.

There are two likely ways in which the physicist should be able to help the cheesemaker. First, good quality cheese is built up from "good" (*i.e.* desirable) atomic partnerships. In some cases, the physicist can find out more about the nature of these partnerships than the chemist.

The second approach is to find out what various kinds of energy do to cheese, as distinct from what the cheese does to the energy; and the simplest case to study is mechanical energy. Experiments have been carried out with a ball compressor as an alternative to the "thumbing" of cheese by the grader. It takes years to train the expert and the number of skilled men is limited, whereas almost anyone can get reproducible results with, say, a ball compressor.

Milling and Baking

By A. J. Amos, B.Sc., Ph.D., F.R.I.C.

Wheat Quality ★ Flour Composition ★ Fungal Enzymes ★ Bread's nutritive value ★ Prices ★ Decline of the small baker

LAST year was a notable one for the milling and baking industries in that it saw the publication of the report of the Cohen Panel and the appearance of new flour regulations and a new bread order. Arising from the introduction of the new regulations there was a change in the nature of flour in the direction of lower extraction and hence of brighter colour.

Wheat quality

The pattern of wheat importations did not change, the bulk of the incoming cargoes consisting of Manitoban wheat, particularly grades No. 2 and No. 3. Australian and Argentine imports came next in the list.

The Manitoban wheats were very similar in quality to those of the previous year, being well below the standard of strength and protein content exhibited by the Manitoban crops of seven or eight years ago. These wheats have of necessity continued to be the "strong" wheats of the British miller's grist, but they have significantly less carrying power for weaker wheats than the Canadian wheats had at one time. The average figures for the cargoes which arrived in 1956, which are given in Table 1, reveal that although the flour-yielding properties of the various grades are different, there was little to choose between last year's grades in protein content and strength. Comparison of the average 1956 figures with the corresponding figures for 1955, which are also given in Table 1, confirms that in general last year's Manitoban wheats resembled those of the previous year.

Another Canadian wheat imported during the year was Garnet. This wheat was not quite as strong as the Manitoban wheats but had a similar stability, which meant that the protein was less distensible. This tendency to some lack of life in the gluten is a usual feature of Garnet wheat and precludes its being used too freely in a breadmaking grist. The 1956 arrivals of Garnet provided the following average figures: protein 11.40%, maltose figure 2·07, stability 80, strength 46.

The industry imports weak as well as strong wheats from North America. These may be used as fillers or as constituents of the weak group in a breadmaking grist, but are employed also in the production of weak flours for confectionery purposes or for making ice cream wafers or sausage rusks. Average figures for these weaker wheats imported during 1956 are given in Table 2.

Table 2. Average Figures for 1956 Arrivals of North American Weaker Wheats

	Protein Content %	Maltose Figure	Stability	Strength
Hard Winter ...	12·45	1·46	82	37
Red Winter ...	10·37	1·14	46	25
Eastern White ...	8·63	1·18	33	17

A well-established filler in British grists is Plate wheat. The 1956 arrivals were similar in strength to the Garnet cargoes but were more proteinous, the average protein content being higher than the averages for most of the Manitoban grades. The average

Table 1. Average Figures for Manitoban Wheat Imported during 1956 and 1955

Grade	1956 Protein Content %	1956 Maltose Figure	1956 Stability	1956 Strength	1955 Protein Content %	1955 Maltose Figure	1955 Stability	1955 Strength
No. 1 Atlantic	12·38	1·60	76	55	12·40	1·75	90	63
No. 2 Atlantic	11·94	1·55	77	54	11·95	1·70	87	57
No. 2 Vancouver	12·09	1·70	85	58				
No. 3 Atlantic	12·06	1·65	78	55	11·85	1·70	88	58
No. 4 Atlantic	12·30	1·60	85	56				
No. 4 Vancouver	12·07	1·75	89	57				
No. 5	12·08	1·95	127	51				

figures were: protein 12·28%, maltose figure 1·53, stability 76, strength 45.

Another popular wheat from overseas which is used both in breadmaking grists and in blends intended for the production of non-breadmaking flours is Australian. The 1956 arrivals were typical of this wheat. They gave the following average figures: protein content 9·54%, maltose figure 1.50, stability 55, strength 20.

A few cargoes of Russian and of French wheat arrived during 1956. The French wheats were typical, being on a par with the weaker type of English wheat. The Russian arrivals were slightly stronger although still weak, but they differed from other weak wheats of similar strength in that they had appreciably higher protein contents. Indeed, they were anomalous wheats, being as weak as many samples of English wheat and yet more proteinous than many Manitoban samples. Average data for the French and Russian arrivals are in Table 3.

Table 3. Average Figures for 1956 Arrivals of French and Russian Wheats

	Protein Content %	Maltose Figure	Stability	Strength
French	8·95	1·27	37	17
Russian	12·20	1·70	44	23

The home grown wheats available for about the first nine months of 1956 were 1955 crop wheats. They had a normal range of protein content and strength and low maltose figures. Average figures were: protein content 9·62%, maltose figure 1·38, stability 47, strength 24. In the last three months of the year the 1956 crop became available. Much of this was inferior to the previous crop, to an extent which presented millers with difficulties. Sprouted wheat and high maltose figures were common, and the moisture content and, in some instances, mould growth led to a marked deterioration in the colour of the flour obtained from the wheat.

The Flour (Composition) Regulations 1956

Before the beginning of October of last year millers could produce either National flour, which was required to be of 80% extraction, or flour of lower extraction which had been "restored" with vitamin B_1, nicotinic acid and iron to the levels recommended by the Conference on the Post-War Loaf. Bread made from National flour was subsidised and hence was cheaper than bread made from the restored flours of admittedly less than 80% extraction. Despite the regulations, however, the extraction rate of National flour gradually dropped and by 1956 was about 74%, which meant that the cheaper National bread was inferior in nutrient content to whiter bread made from restored flour.

On September 30 last new flour regulations became operative. A prescribed rate of extraction disappeared and with it National bread, but *all* flour was required to contain not less than prescribed amounts of vitamin B_1, nicotinic acid and iron, these amounts being those recommended by the Conference on the Post-War Loaf. Whether the levels were attained by milling to long extraction or by fortification was a matter of choice; the Order required only that the stated amounts of the nutrients should be present and was not concerned with means by which their presence was ensured. The new regulations did permit, however, the use of an alternative source of iron, which could be either *ferrum redactum* or ferric ammonium citrate.

The fourth nutrient which has to be added to all flours except wholemeal is calcium, and this must be incorporated in the form of *creta præparata*. Instructions in the new regulations about this compound,

Finnish Millers buy British

Three views of the milling plant which Thos. Robinson and Son. Ltd., erected for the Finnish Co-operative Wholesale Society O.T.K. (Osuustukkukauppa, Helsinki) last year. The plant comprises cleaning, milling (flour and rye), and packing departments, a warehouse and grain silos. In addition, a provender plant and—in the future—a bakery, are being put up on the same site.

Left. *The purifier floor of the flour mill showing the battery of nine all-metal double-sieve purifiers.*

Centre. *Two of the six automatic bag packers filling all sized bags.*

Right. *Part of the 25-30 ton rye mill served by five roller mills.*

however, are different from those relating to the "token" nutrients in that both a minimum and maximum limit are prescribed. The limits chosen permit a deviation of ±25% from the previously prescribed addition of 14 oz. per sack. An appreciable allowance on either side of the desired addition is necessary because the physical properties of *creta* are such that uniform distribution of the supplement throughout the flour is difficult to achieve. A sack of flour might contain 14 oz. of *creta*, but it would not follow that a 100 g. sample taken for analysis would contain an equivalent proportion. At an extraction rate of 72%, the extraction rate which became general for basic flour under the new regulations, the excuse that an addition of *creta* is needed to counteract the calcium-immobilising effect of phytic acid becomes untenable. Continuance of the practice can be justified only if it is shown that in its absence the population would experience a calcium deficiency.

Flour quality

The nature of the Manitoban wheat has necessitated its being maintained at a high proportion in the bread grist, and figures in the region of 70% have not been uncommon. By this means it has been possible to produce baking flours of satisfactory strength and water absorption. During the first eight months of the year, when home-grown wheat of the 1955 crop was being used in conjunction with the Manitoban in the blend, many flours had sufficiently low maltose figures to warrant diastatic correction. Malt flour was mainly used for this purpose, but a few mills used a fungal amylase as the corrective.

National flours made during 1956 gave grade colour figures of about 3, although a flour of 80% extraction has a colour figure of about 5·5. The corresponding Patent flours had grade colours of 1 or less. When the new regulations became operative at the end of September the extraction rate of the basic flour, which ceased to be known as "National" flour, and the bread from which no longer attracted a subsidy, was further reduced and a colour figure of about 2 became common. There was still a demand for a weaker flour which could be blended with strong imported flour in the bakery, a demand which had previously been met with "English National" and "Soft National," and millers accordingly agreed among themselves to offer four types of flour. These were:

(1) A basic grade to be known as "Baker's Flour" which would be made from a blended grist and milled at about 72% extraction.

(2) A Patent low extraction flour to be known as "Bakers' Patent" which would be made from the same grist as the basic grade.

(3) A softer type of bread flour made from a softer wheat grist which would be known as "Winters Flour." This would be produced at approximately the same extraction rate as the basic grade.

(4) A straight run unenriched flour which would be known as "High Extraction Flour." This would be made from the same grist as the basic grade, but no extraction rate would be specified. The extraction rate, however, would be sufficiently high to ensure that the prescribed nutritional level was achieved solely from the milling process.

The three fortified flours and the one unfortified flour would achieve the nutritional level in respect to vitamin B_1, nicotinamide, iron and calcium prescribed by the Flour (Composition) Regulations, 1956.

The inferior nature of the 1956 crop of home-grown wheat, due to the adverse climatic conditions, was reflected in a deterioration in the colour of those

flours milled from grists containing a high proportion of British wheat, as, for example, self-raising flours. Such flours milled from grists containing home-grown wheat of the 1955 crop often had grade colour figures of about 2, but when the 1955 crop was replaced by that from the 1956 harvest this figure rose to 3·5 or higher.

Microbial enzymes

In our Review of the Milling Industry for 1954 (FOOD MANUFACTURE, February 1955) we forecast that the trend in U.S.A. for fungal enzymes to be used as flour correctives would be followed by a similar move in Britain. Signs of this were apparent during 1956, although the initial line of approach was somewhat different from that which occurred in the United States. Millers were advised of a commercially available proteolytic enzyme which could be used to correct an excess of strength and elasticity in a flour intended for biscuit manufacture. The enzyme was marketed in a diluted form which called for its use in a proportion of about 1 oz. per sack. Alternatively, it could be used by the biscuit manufacturer as a dough additive on those occasions when a dough weakening agent, such as sodium bisulphite, might be considered. Fungal proteolytic enzymes are used in America, but they are added to bread doughs in order to correct excessive toughness or "buckiness."

A fungal enzyme intended as a diastatic corrective also appeared on the British market. Its purpose was to serve as an alternative to malt flour on those occasions when a flour had insufficient diastatic activity to produce an adequate supply of reserve sugar for the yeast in panary fermentation. Although this trend is yet in its infancy in Britain, much interest is being shown in it and further developments can be expected.

The Cohen Report

Although the Widdowson and McCance Report (Medical Research Council Special Report Series No. 287, 1954) supplied a factual answer to the Conference on the Post War Loaf's query about the relative nutritional merits of long extraction flour and fortified flour, the Government did not reject long extraction in favour of fortification until it had obtained further authoritative confirmation of the soundness of such a policy. At its request the President of the Royal Society nominated an impartial panel which was given the task of reviewing the scientific and medical evidence available on the differences in composition and nutritive value of long extraction flours and fortified and unfortified low extraction flours. The panel, under the chairmanship of Sir Henry Cohen, received written evidence from numerous sections of the flour industry, from the medical profession, from Ministries and from other interested parties, and in some instances also heard oral evidence. The panel issued its report, a 33-page document, in May of last year, and in it gave as its considered opinion:

> "Taking into account all the circumstances, and bearing in mind particularly the needs of the vulnerable groups in the population, the Panel concludes that the available evidence does not reveal any ascertainable difference between National flour as defined in the Flour Order, 1953, and flours of extraction rate less than National flour, to which vitamin B_1, nicotinic acid and iron have been restored in the amounts specified in the Flour Order, 1953, which would significantly affect the health of the population in any foreseeable circumstances. They believe, however, that differences between low extraction flour enriched as specified and low extraction flour not so enriched are significant."

In the light of this report and the earlier finding of the Widdowson and McCance experiment, the Government made its decision against enforced long extraction and implemented that decision in the new Flour Order which became effective four months later.

Nutritive value of bread

The Widdowson and McCance Report (see Review of the Milling Industry for 1954, FOOD MANUFACTURE, February 1955) revealed that when bread formed a high proportion of the diet of undernourished German children, wholemeal bread gave no nutritional advantage over white bread. This finding came as a surprise—and maybe as a shock—to those responsible for the design and conduct of the test and to many others, and it was perhaps not unexpected that in some instances disappointment at the result gave birth to attempts to discount the soundness and value of the tests. Widdowson and McCance, however, had the courage to admit that the views they had held on the relative nutritional merits of white and brown bread had been at fault and to state frankly in the preface to their absorbingly interesting book "Breads White and Brown: Their Place in Thought and Social History," which was published late in 1956, "We came to the conclusion that our ideas had been wrong." Only the penultimate chapter of the book deals with the German experiment, the previous seven chapters comprising a collection of written opinions and facts relating to white and brown bread from the time of the early pyramids to 1955. The scope of the references is extremely wide and the book makes fascinating reading.

Although no nutritional difference was found between white and brown bread in the experiments with German children, Widdowson and McCance did find that wholemeal gave a greater rate of growth than white bread when weanling rats up to the age of eight weeks were the test animals. Subsequent work by a team from the Research Association of British Flour-Millers has indicated that this difference between the two types of bread for weanling rats is due to the slightly greater lysine content of the brown bread. Weanling rats are very sensitive to small changes in the lysine content of the diet when this amino acid is present to an extent of 0·3-0·5% and the inferiority of white bread could be eliminated in their tests by supplementation with lysine. The superiority of wholemeal over white flour disappeared

when the test animals were rats of more than eight weeks of age, and the breads then showed equal nutritional value, as they did in the tests with children.

Frazer *et al* (*J. Science, Food and Ag.*, 1956, **7**, 361 and 464) reported in four papers the results of a series of chemical and biological studies on the effects of treatment with chlorine dioxide on the properties of wheat flour. Their final conclusions were:

> "It may be concluded from these and previous studies, as well as from the work of many other investigators, that the chlorine dioxide treatment of flour at normal level does not have any significant deleterious effect on its nutritional value, as shown by chemical analysis of the flour proteins, or assessment of their biological value. The changes in vitamin E content that occur on normal storage and with aeration treatment, as well as with chlorine dioxide treatment, are not considered to be significant in terms of human nutrition. There is no evidence of the formation of abnormal or toxic products."

Decontrol of bread prices

Under the regulations which were in force before September 29, 1956, only National bread was subsidised and the price of the 1¾-lb. National loaf was fixed at 8½d. The subsidy per 1¾-lb. loaf was rather greater for the small baker than for the large baker, but was of the order of 1½d. This gave a small margin to the craftsman baker in a small way of business, who was further handicapped by a loss of customers who were won over to wrapped and sliced bread. The result was that very many bakers—in the region of 11,000—stopped making price-controlled bread.

Discussions in various sections of the trade which took place when price decontrol was imminent made it clear that when the subsidy ceased the price of bread would vary from area to area and even within an area according to the size of the bakery; the price would be higher in inland areas than in the port areas and higher in the small bakeries than in the plant bakeries. The prices suggested for the 1¾-lb. unwrapped tin loaf varied from 10d. to 1s., and from 6d. to 7d. for the corresponding 14-oz. loaf. Prices would be increased for sliced and wrapped bread, perhaps by 1d. a loaf, and by a ½d. per loaf for other types of bread, such as oven bottom loaves. These suggestions were made on the assumption that the price of flour did not rise.

An unexpected happening on the first day of decontrol was a sharp reduction of 3s. per sack in the price of port area flour produced by one of the large milling groups. The next day other millers brought their prices in line, and on the following day all millers had cut the price in port areas by another 1s. per sack. The price of 95s. per 280 lb. thus reached did not last long, however, and within a month the price had returned to and then passed the original level; by the end of November it stood at 117s. per 280-lb. sack.

The new pattern of the baking industry

The growth of large plant bakeries and the consequent marketing of sliced wrapped bread by grocers and others has badly affected the small bakeries. Because of this and other factors a large number of small bakers have gone out of business. This diminution in the number of retail outlets available to the milling industry has been followed by the incursion of large milling concerns into the baking industry. By acquiring bakeries a mill establishes a guaranteed outlet for part of its output. As a result of this trend the large bakery groups now take 50% of the total flour used. Plant bakeries of medium size, biscuit manufacturers and flour packers consume a further 25%, so that the small bakeries, which now number about 10,000 compared with over 20,000 20 years ago, use no more than one-quarter of the total flour produced.

Fungal Enzymes for British Bakers and Millers

CONSIDERABLE interest has been aroused by the use in the U.S.A. of fungal enzyme supplements in the baking of fermented goods.* The commercial use of these enzymes has now commenced with the introduction of the first fungal alpha amylase manufactured in Great Britain under the name of *Amylozyme B* and a protease known as *Proteinase 18* by Norman Evans and Rais Ltd.

These enzymes make it possible for bakers and millers to make accurate and individual corrections to the enzyme contents of baking flours. Malt flour has been used for the same purpose for a great many years, but the failings of this product, due mainly to the mixed enzyme content, have become more and more apparent as knowledge of the subject grows and the demand for the production of a standard product becomes more essential to facilitate ease of production. Reports from the U.S.A. have shown the advantages of having separate alpha amylase and proteinase available, but it should be borne in mind that conditions in the U.S.A. are, in certain instances, very much different from our own.

With the manufacture of these enzymes in Great Britain sufficient practical trials have now been made to show the advantages to be gained by using them in place of the present enzyme supplements. Of primary importance is the selectivity of the enzymes and their low thermo-stability. The baker is now able to correct alpha amylase deficiency without serious interference from the proteolytic enzymes and *vice versa*. The low thermo-stability of the alpha amylase reduces the risk of gummy or sticky crumb through the over-production of dextrins. Trials on plant bakeries have shown this latter point to be of extreme importance where automatic slicing is carried out. The break baked

* See FOOD MANUFACTURE, July, 1955, pp. 274-276.

with fungal alpha amylase can always be relied upon to slice cleanly each time. Experiments have been made in an effort to produce gummy or sticky bread and up to double the required quantity of the fungal alpha amylase has been used without any particularly harmful effect on the loaf or its slicing capabilities. A much better crumb is produced under normal circumstances and, in addition, the bread is rendered more resistant to staling.

Water absorption is improved in the majority of cases as shown in the table below, which is a distinct commercial advantage.

	Gallons per sack		
	1.	2.	3.
Control	16·2	15·9	16·3
½ oz. *Amylozyme B*	16·0	15·9	16·3
1 oz. *Amylozyme B*	15·7	15·9	16·1
6 oz. malt flour ..	15·5	15·5	15·3

Above additions made per sack of 280 lb.

In view of the very recent commencement of production of the fungal alpha amylase in the United Kingdom, the quantities used can only be broadly recommended. These are as follows:

Maltose content		*Amylozyme B per sack*
1·6 to 1·8	—	1½-1¾ oz.
1·8 to 2·0	—	1 oz.
2·0 and above	—	½ oz.

These maltose contents are taken on the current Sandstedt method.

In some cases it will be necessary to alter the amounts slightly according to local conditions in each bakery.

The proteolytic enzymes are also available in the United Kingdom and have been successfully used for the past six months for standardising biscuit flours. Whether the use of *Proteinase* in Britain will extend to bread manufacture on the same scale as in the United States remains to be seen. Current trials at various bakeries suggest that a much smoother dough is being obtained and that the mixing time is appreciably reduced. Proteinase has been of great use to the miller in enabling the production of a standard biscuit flour and, in addition, to soften very tough wheats which have hitherto been more or less unacceptable to the biscuit industry. For biscuit purposes the enzyme is added by the miller at the rate of ¼ to ½ oz. per sack, depending upon requirements. The main advantage of this enzyme over present methods of softening and standardising is the fact that the enzyme remains *in situ* in the flour and does not start work until water is added at the biscuit bakery, thus there is no reversion of the protein quality as the flour is stored, as happens with the present methods.

It is felt that most advantages are to be gained by the baking industry from the use of the fungal alpha amylase. However, smaller quantities of *Proteinase* than are used in the U.S.A. may be of assistance to bakers in speeding up processes. This is the subject of a large amount of experimental work at the present moment and results will be published as obtained.

Food and Dietetics

THE first edition of Sir Robert Hutchison's book appeared in 1900, and for 56 years it has, through successive editions, kept pace with the growth of the science of nutrition and has remained a standard text-book with a wide appeal.

About one-third of the revised edition* is concerned with the basic principles of nutrition, another third with the major and minor components of foodstuffs, and the remainder with practical dietetics. This edition, like its predecessors, will be widely used by clinicians and dietitians, who will welcome it as a reliable guide. The book can, however, be confidently recommended also to all who are in any way concerned with food manufacture; scientific workers in the food industries will find it of great value because of the clear treatment of the fundamentals of nutrition and of the nutritional rôle of food components.

A short but useful chapter deals realistically with the nutritional aspects of the processing and storage of foods and stresses the need for scientific control—chemical, biochemical and bacteriological—at all stages. Tribute is paid (page 174) to the activities of the Food Group of the Society of Chemical Industry, and the success of FOOD MANUFACTURE is quoted as evidence of the changed attitude of industry in recent decades.

Information regarding nutritional aspects of food processing is provided also in various chapters dealing with the composition of various types of foods such as cereals and cereal products. It is interesting to read the conclusions of the authors regarding recent experiments and reports on bread. The authors believe that "the logical deduction . . . is *not* that 70% extraction bread is as good as wholemeal, etc., *at any time or place*, but probably that if one's diet is satisfactory in calcium, iron and vitamins A, C and D it does not matter what bread one eats."

Useful sections of the book are devoted to fats, carbohydrates, milk, eggs, meat, fish, fruits and vegetables and also to beverages—non-alcoholic and alcoholic. Although the authors do not support the extensive use of alcohol in medical practice, their conclusions in this regard are marked by a common-sense approach characteristic of the book as a whole: "People who are used to alcohol may often be allowed it in their diet when they are on special diets, because they are miserable without it, and the misery produces a more deleterious effect than the alcohol."

F. AYLWARD.

* *Hutchison's Food and the Principles of Dietetics*. Revised by V. H. Mottram, M.A., and George Graham, M.D., F.R.C.P. Edward Arnold, 1956. Pp. 630. 40s. net.

▶ To show the advantages of electricity in securing hygienic food preparation, the Electrical Development Association have issued a 12-page illustrated brochure called *The Clean Way to Clean Food*. It has six main sections, dealing with the use of electricity in providing hot water, dish washing, floor cleaning, lighting, food storage and pest control.

How to Improve the Keeping Qualities of Fruit and Vegetable Concentrates

By K. Vas *

Fruit and vegetable concentrates are attacked by "osmophilic" organisms whose activities are prevented only at equilibrium relative humidities below those usually attained. Means of inhibiting these organisms are considered in this contribution from Hungary. Heating and preservatives (excepting natural acids) are excluded. Reduction of e.r.h. by adding osmotically active substances like salt or glycerol is proposed, and experiments are described in which this procedure was applied to tomato and fruit products. Another possibility described is ion exchange de-mineralisation. The author contends that by adopting these modifications of normal practice, microbiologically stable products can be obtained without spoiling the flavour, etc.

THIS article discusses the keeping qualities of certain groups of concentrated vegetable foods, such as fruits and tomato. The storage life of these products is mainly a function of their equilibrium relative humidity (e.r.h.), although there may be a complementary effect of acidity (*p*H) and of specific antimicrobial agents, either occurring naturally (phytoncides) or added as preservatives.[1, 2] But acidity chiefly retards the growth of bacteria, providing practically no protection against yeasts and moulds; while the application of chemicals is prohibited or restricted in most countries by law.

The safe storage of the above products cannot be guaranteed under all conditions if they are prepared with the composition usual in internationally recognised recipes: indeed, the word "preserve," as normally used, recognises that fact. Further, it will be shown how these difficulties could be overcome, *i.e.* how it would be possible, by modifying the usual recipes, to prepare a really stable product of similar composition—a "conserve" in the European sense of the word, instead of a "preserve."

Microflora of the concentrates

It is desirable first to consider briefly the relevant aspects of the microflora of these concentrates.

Numerous data in the literature, besides our own experience, confirm the opinion that the main role in the deterioration of concentrated or dried food products is played by Aspergilli of the *glaucus* group, and by osmophilic yeasts which are members of the genus *Zygosaccharomyces*, now called *Saccharomyces*, as the most resistant organisms. These have been identified as the agents causing deterioration: *e.g.* in honey;[3] in concentrated orange juice;[4] in concentrated pear juice;[5] in "Sirop mélangé," which is a mixture of the concentrated juices of beets and apples;[6] in barrelled tomato purée;[7] in candied fruits;[8] on dried peas;[9] in must concentrates,[10] and in malt extract.[11]

In the absence of specific antimicrobial agents, these micro-organisms grow in food products with a "state of hydration" (equilibrium relative humidity or relative vapour pressure, called "Hydratur" by Walter)[12] above 75%.[13] Although there are indications in the literature[5] that yeasts can grow in concentrates of e.r.h. about 62%, such cases may be rare, because no such strains have been encountered in our experience, nor in the course of a systematic examination of 48 osmophilic yeasts of different origins obtained from the collection of M. Ingram. Deterioration in our experience is caused most frequently by *Saccharomyces rouxii* Boutroux.

Thus, in order to prevent spoilage of these products, growth of the above two groups of micro-organisms has to be controlled.

Equilibrium relative humidity of the concentrates

According to our measurements, the e.r.h. of the concentrates in question is not low enough to prevent growth of osmophilic yeasts and moulds. From examination of many samples of tomato purée containing 38-40% of soluble tomato solids (measured refractometrically) and 8-10% of added NaCl, it was found that the e.r.h. of this product is usually about 85-87%. Without the addition of salt, this value was about 95%.* The e.r.h of jams and preserves is, similarly, rather high: *e.g.* Money and Born[15] found an e.r.h. of 80% in a jam with 65·4% total solids (18·4% sucrose, 45·5% invert sugar and 33·1% water). According to Grover[16] the e.r.h of jams varies between 75 and 82%. Our investigations on preserves showed e.r.h.s around 85% at a total soluble solids content of 60%; with 63-65% of total soluble solids, the resulting e.r.h. was about 80%.

Similarly, as experience shows, the acidity, and the ultimate concentration of naturally occurring phytoncidal substances, do not provide the necessary protection against micro-organisms.

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* Measurements of e.r.h. were made chiefly by our modification[9] of the method of Pouncy and Summers,[14] based on the deliquescence of crystal fragments.

Improving the keeping qualities

Hence, as was said above, the composition of concentrates prepared according to conventional recipes is incapable of preventing spoilage by micro-organisms which can act in materials with e.r.h.s above 75%. In this range, only one procedure can be utilised at present — heat treatment at some stage of manufacture. However, this procedure, even if applied at the last stage of production, gives no protection against "after-infections," apart from the undesirable organoleptic changes usually associated with heating. We have, therefore, to consider other methods.

Diminution of e.r.h.

At the outset, it has to be accepted that in most instances it is not at present practicable to increase the acidity or the phytoncide content of the preparations. Thus, the most obvious possibility seems to be to reduce the e.r.h., which may be achieved either by increasing the concentration or by the addition of certain substances.

Increasing the concentration may lead to difficulties in practice. Often, evaporation cannot be continued too far because of irregular boiling or difficulties in mixing and emptying. Moreover, concentration beyond the usual solids content is sometimes ineffective in reducing the e.r.h; for example, in the case of tomato purée, the relation between e.r.h and degree of concentration (T=soluble tomato solids of the purée), illustrated in Fig. 1, shows that in order to bring the product below the critical e.r.h. level of 75% one would have to increase the concentration to an extent which will often be impossible or would give a product with too hard a consistency. Nevertheless, for many purposes, even such a highly concentrated product may be satisfactory. According to our experience with pilot plant, careful evaporation need not cause considerable losses of organoleptic quality.

The state of hydration (e.r.h.) can be reduced much more effectively, and without excessive

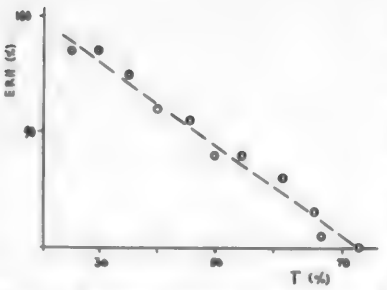

Fig. 1. Relation between the degree of concentration (indicated as soluble tomato solids T) and equilibrium relative humidity for tomato puree.

changes in consistency, by the addition of suitable osmotically active substances of low molecular weight. In the course of our experiments, invert sugar, fructose, glycerol and sodium chloride were employed. In equal concentrations by weight, these substances give more particles (molecules or ions) in solution, because they possess smaller molecules than sucrose, and in this way are more effective in increasing osmotic pressure or decreasing vapour pressure. Following the data of Grover,[16] which are based on the diminution of vapour pressure by sucrose, conversion factors can be calculated as in Table 1.

Table 1. Conversion factors for comparing the effects of different substances in changing state of hydration (e.r.h.)

	Conversion factor
Sucrose	1·0
Invert sugar	1·3
Glycerol	4·0
NaCl	9·0

This means that the vapour pressure of water can be reduced to the same level by dissolving 1 g. sucrose, or $\frac{1}{1{\cdot}3}=0{\cdot}77$ g. of invert sugar, or $\frac{1}{4{\cdot}0}=0{\cdot}25$ g. glycerol, or $\frac{1}{9{\cdot}0}=0{\cdot}11$ g. NaCl.

There can be no objection to the use of these substances in foods, because invert sugar, fructose and NaCl are normal constituents of foods. Even glycerol is an accepted ingredient in some products: apart from its presence in fermented beverages (wine or beer) to the extent of a few tenths of a per cent., several per cent. are usually added to confectionery products (*e.g.* fondant cream,[15] candies and syrups)[17, 18] and a recent proposal[19] has been to use glycerol to improve the texture of dried fruits. Our earlier investigations have shown that glycerol exerts a powerful action on the growth of yeasts.[20]

Fructose may be of special value in this connection. Because of its high solubility it can yield solutions of very low e.r.h., which show no tendency to crystallise and do not cause "sugaring" of the products. From our experience, its use may be recommended in the manufacture of candied fruit and jam, and even in the production of tomato concentrates; particularly as fructose syrup can now be manufactured by the hydrolysis of inulin from Jerusalem artichokes.[21] It is a great advantage of fructose that it can be tolerated by diabetics, according to recent investigations.

Stability may be improved similarly by *common salt*, at least with products to which it can be added without spoiling the flavour. It will be shown later how the storage life of tomato concentrates may be prolonged without deterioration of flavour by using NaCl; here, it may simply be added that experiments are in progress in this Institute to improve the drying of peas and other vegetables, utilising the e.r.h.-reducing effect of NaCl.[22, 23]

We also considered the use of the osmotically active sugar D-xylose, which has a relatively low molecular weight (M=150). It can easily be produced by the hydrolysis of sunflower seed shells and, according to many authorities, may be included in the diet of diabetics without harmful effects. Although there are differences of opinion about the physiological effects of this substance (Wise *et al.*[24] and Bellows and Chinn[25] having shown that it promotes cataract formation while Benk[26] states that its use for diabetics is accepted in many countries), the osmotic properties of its solutions

have been investigated in a few preliminary experiments. The e.r.h. of a saturated D-xylose solution (54%)[27] was found to be 84%. Hence, because of its relatively low solubility, it is impossible to prepare from it a solution of low enough e.r.h., although xylose is more active osmotically than sucrose or fructose—in a 54% solution the latter give e.r.h. values of 92 and 86% respectively, calculated according to the formula of Money and Born.[15] However, its antimicrobial properties are worth further examination, because yeasts are unable to ferment this sugar; hence, its behaviour in the presence of yeasts and moulds is now under detailed investigation in our laboratory.

Addition of antimicrobial agents

The second alternative for improving the keeping quality of concentrates is the addition of specific antimicrobial agents. Because the use of preservatives (benzoic, salicylic, sulphurous or formic acids) is severely restricted in many countries, other, completely innocuous, substances have been considered. The most obvious of these is acetic acid which our experiments show to be a very powerful agent against osmophilic micro-organisms, its action being largely independent of *p*H. But the use of this substance is possible only in products whose flavour is not spoilt by its addition.

Thus, concentrates whose consistency would be impaired by reduction of e.r.h. may be made stable by the addition of acetic acid, if their flavour is not spoiled thereby. Owing to the volatility of this acid, products treated with it may be kept in a perfect state if only they are hermetically sealed.

Some practical applications

A few examples of the application of the procedures mentioned above, singly and in combination, will now be described.

Tomato concentrates

In the course of experiments with tomato purée we tried to improve its stability against osmophilic yeasts by reducing the e.r.h. First, the addition of salt was tried.[7] Purées concentrated to a refractometer value of 65% were mixed with water and salt in such a manner that a series of purées, with various contents of soluble tomato solids and of NaCl, were obtained in 100 g. quantities. Their e.r.h. values were measured, they were then inoculated with 10^7-10^8 cells per g. of an osmophilic strain of *Sacch. rouxii* Boutroux, and incubated at 28°C. for several months. The composition of unchanged samples, and of samples showing fermentation, changes in odour, or visible yeast growth, are illustrated in Fig. 2, where a line has been drawn between fermented (full circles) and unspoiled samples (open circles), following Bell and Etchells.[28] The equation of this line has been calculated, and in the range between 40 and 70% total soluble solids

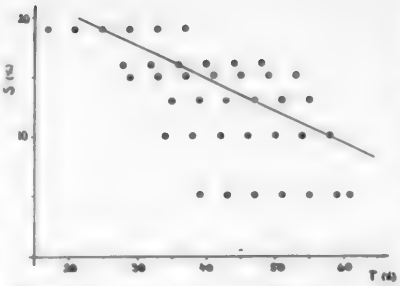

Fig. 2. Relation between the degree of concentration of tomato puree (indicated as soluble tomato solids T), the concentration of NaCl (S), and spoilage in storage (black circles spoiled, white circles unspoiled): 100 g. samples inoculated with 10^7 - 10^8 yeast cells per g.

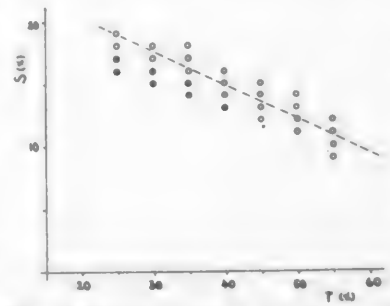

Fig. 3. Relation between the degree of concentration of tomato puree (indicated as soluble tomato solids T), the concentration of NaCl (S), and spoilage in storage (full circles spoiled, open circles unspoiled): 1 kg. samples inoculated with 6.10^6 yeast cells per g.

(*i.e.* tomato + NaCl) salted tomato purée has to comply with the following equation if it is to be stable:

$$T + 3{\cdot}67\,S \geq 94{\cdot}6$$
$$(\text{or } S + 0{\cdot}273\,T \geq 25{\cdot}82)$$

where T means the soluble solids content deriving from the original tomato juice, and S the NaCl content added, both in per cent. The e.r.h. of such purées was around 73-75%.

The position of this borderline has been confirmed in more recent experiments; for example, changing "T" at intervals of 5% between 25 and 55%, and "S" at intervals of 1%, in 1 kg. samples, yielded the results in Fig. 3. Inoculation was at the level of $6{\cdot}10^6$ *Sacch. rouxii* cells per g. and the samples were incubated at 28°C. for 10 months.

It may be seen that, in the range indicated, compliance with the above formula indicates "absolute" safety against spoilage caused by osmophilic yeasts. The fact that, in the second series, samples proved stable even where T and S were lower than in the first series, may be explained by the lower level of inoculation in the second series of experiments.

This means that completely stable purées can be obtained with 50% tomato solids + 12% salt, or 40% solids and 15% salt, or 33% solids and 17% salt, or 25% solids and 19% salt. Preparations of the above four compositions were compared organoleptically with a sample of the composition recognised in international use—39% solids + 9% salt. The results of tasting tests on soups prepared from these five purées have been statistically analysed in a previous paper,[7] and it was shown that from the point of view of flavour a composition of about 17% salt + 33% tomato solids marks the maximum salt content which can be tolerated. Below this value, soups of good flavour, similar to that of the control, can be obtained if care is taken to ensure that the salt content of the soup does not exceed 1% on diluting the purée. In the range examined, the quality of the soup was more influenced by its salt content than by its content of

tomato solids. This indicates that soups of satisfactory quality can be prepared from tomato concentrates containing much more salt than has been usual hitherto.

Besides the addition of salt alone, other treatments were tried in combination, always bearing in mind that the change of composition should not affect flavour unfavourably. Thus, addition of acetic acid was combined with mild salting. While maintaining the soluble tomato solids content at the fixed level of 38% (refractometer) the salt (S) and acetic acid (A) content of the samples was varied. After inoculation with some $5 \cdot 10^7$ cells of *Sacch. rouxii* per g., the samples were sealed, held at room temperature for 7-10 months and observed for visible fermentation or production of off-flavour. The results are shown in Fig. 4, where the notation is as in Figs. 2 and 3.

Fig. 4 shows that, in the range between 0 and 10% salt, plus 0 to 0·8% acetic acid, with a tomato purée of 38% soluble solids, safety with respect to fermentation may be obtained by satisfying the equation:

$$A + 0 \cdot 45\, S \geq 0 \cdot 6$$

A pilot plant experiment, with 12 kg. quantities in small barrels, confirmed that the above formula gives satisfactory results in practice.

To decide whether addition of acetic acid impairs the organoleptic properties of the products, tasting tests were made on soups prepared from them. Samples with 38% tomato solids and 3% salt, and with 0, 0·2 or 0·5% of acetic acid, were diluted to 4·5% tomato solids. To every 300 ml. of these samples, 6 g. of roasted flour and 4 g. of sugar were added. Using a taste panel of 11 members, and the method of the triangular test, it was found that the soup made from the sample containing 0·2% of acetic acid was distinguished from the control by only four persons, and that made from the sample with 0·5% acetic acid by only three. Since significant differences are established only if there are 7 correct judgments out of 11,[29] it may be concluded that the presence of acetic acid did not impair the flavour of the concentrates, especially in view of the fact that the soup prepared from the sample with 0·5% acetic acid was considered better than the control by all those tasters who judged correctly.

Table 2. The properties of tomato purees with additions of common salt, fructose and acetic acid.

No.	Soluble tomato solids refracto-meter value	Salt (%)	Fructose (%)	Acetic acid (%)	Total soluble solids (%)	E.r.h. (%)	Consis-tency	Flavour
1	38	0	20	0·3	58	88	+	++
2	38	0	30	0·2	68	81	+	+
3	38	0	35	0	73	74	++	—
4	38	3	0	0·3	41	90	—	++++
5	38	3	10	0·3	51	90	—	++
6	38	3	10	0·2	51	90	—	+++
7	38	3	20	0·3	61	86	+	+
8	38	3	20	0	61	81	+	—*

* became mouldy after 7 months.

	Consistency	Flavour
++++		sharp
+++	hard	rather sharp
++	rather hard	sourish
+	rather soft	pleasantly sourish
—	soft	not sour

The combined application of acetic acid, salt and fructose was also tried. At the fixed level of 38% tomato solids, various quantities of these additives were incorporated and the mixtures inoculated with about 10^7 cells of *Sacch. rouxii* per g. of purée; and the samples were inspected frequently during 7 months' storage at room temperature. Two series of experiments were made, in which the added NaCl levels were 0 and 3% respectively. The results are illustrated in Fig. 5, which shows that the danger of fermentation is considerably lessened by the addition of fructose, especially in the simultaneous presence of salt.

Some of the formulæ, which yielded stable products, were tried in larger units, subjected to 4 months' storage and tasted; the e.r.h. of the samples was also determined. The results are shown in Table 2.

It appeared that new types of tomato product, of pleasant flavour, could be obtained by applying fructose, salt and acetic acid in various ways. They possessed good keeping qualities, except for sample No. 8, which became mouldy; in products of high e.r.h., like sample 8, the presence of acetic acid is clearly indispensable.

The above preparations are novel foods, rich in vitamin C, which may serve as tasty spreads upon bread. Their commercial introduction seems to be warranted, if consumer preference studies confirm their suitability.

Fruit products

That preserves and jams, prepared according to prevalent formulæ, do not give products of absolute stability is proved by the fermentation and mould growth which occur in practice. This is readily explicable by the high levels of e.r.h. in such products. Substantial improvement cannot

Table 3. The composition, and equilibrium relative humidities at 25°C., of some sugar mixtures in aqueous solution (determinations by the method of Pouncy and Summers[14], modified[9]).

Sucrose (%)	Glucose (%)	Glycerol (%)	Water (%)	Total solids (%)	E.r.h. (%)
46·9	25·7	—	27·4	72·6	76
44·0	—	28·0	28·0	72·0	73
—	40·0	30·0	30·0	70·0	73
40·2	26·1	8·4	25·3	74·7	73
33·1	24·8	21·1	21·0	79·0	59
20·5	21·1	43·8	14·6	85·4	45

be expected from increased concentration of sugar, owing to the low e.r.h. of saturated sucrose solutions—about 85% at room temperature—so that addition simply of more sucrose cannot increase stability satisfactorily unless considerable inversion takes place.

In a search for other additives, the e.r.h.s of some sugar mixtures were measured. The solubility tables of Segur and Miner[17, 18] were consulted in the selection of worthwhile combinations; solutions which in their experiments represented the maximum solubility or soluble solids content, at 25°C., were prepared and their e.r.h. values determined as in Table 3.

Table 3 shows that in contrast to the value of 85% for saturated sucrose solution, the e.r.h. may be considerably diminished and brought into the region for safe storage, by the addition of glucose and especially by the simultaneous addition of glucose and glycerol. Of course, high proportions of glycerol cannot be used in practice, but even small concentrations can considerably reduce e.r.h. with a favourable effect on consistency. In our experience, the presence of 7-8% of glycerol does not impair the jellying power of pectins. Similarly, considerable reduction of e.r.h. may be achieved by admixture of fructose with sucrose, without damage to consistency. Thus it appears that the stability of jams could be increased by incorporating fructose or a small amount of glycerol into the formulæ of these products.

Similar experiments are now needed with candied fruits, to decide how the rules of their manufacture might be changed in substituting, partly or entirely, sucrose by fructose, which could lead to substantial reduction in the sugar concentration required to ensure stability. At present, the keeping qualities of candied fruits are mainly determined by the state of inversion of their sucrose. The more complete the inversion, the lower the e.r.h. of solutions of the same total sugar content; and fermentation has only been observed in samples with invert sugar contents below 24% and e.r.h. values above 75%. If the more potent and more soluble fructose could be introduced in place of invert sugar, many storage and technological problems could be solved.

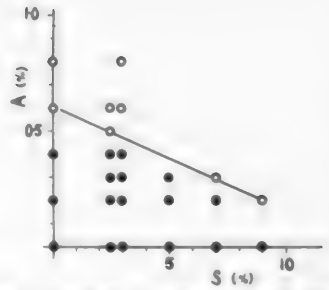

Fig. 4. Relation between the proportion of added acetic acid (A), and of sodium chloride (S), and fermentation in tomato puree of 38% solids inoculated with 5.10^7 yeasts per g. and stored at room temperature for 7 - 10 months. (Full circles fermented, open circles unspoiled).

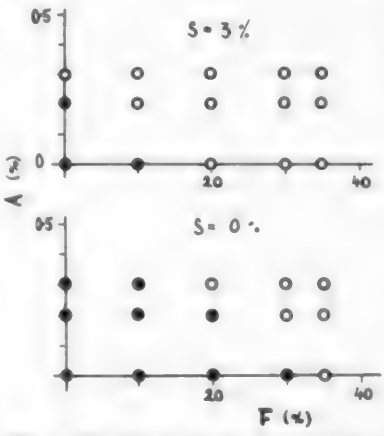

Fig. 5. Relation between concentrations of added fructose and NaCl and fermentation, in tomato puree of 38% tomato solids inoculated with 10^7 yeasts per g. and stored at room temperature. (Full circles fermented, open circles unspoiled).

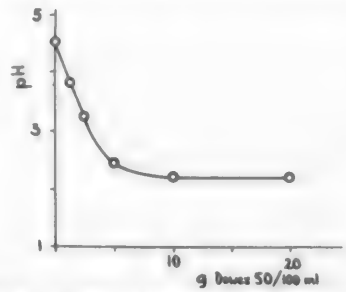

Fig. 6. Relation between the proportion of added cation exchanger and the resulting change of *p*H in fresh tomato juice.

Ion exchange treatment

Trace minerals are known to be necessary for the growth of microorganisms, and Challinor and coworkers[30] were the first to show that this fact could be used in the food industry to increase the stability of fruit juices—they observed that fruit juices completely de-ionised by treatment with cation *and* anion exchangers were more stable against microbial spoilage than original juices. Our investigations have shown that fermentation by yeasts can be prevented by a single treatment on a cation exchanger:[31] it is necessary to deprive the juices only of their cations, especially metallic ions. Even moulds grow only to a very limited extent on such juice, and this also occurs in completely deionised juices: protection against their growth can be simply achieved by reducing the surface area or by adding minimal quantities of sulphurous acid.

More recently, the removal of metallic cations from tomato juice has been tried. No difficulties were encountered with the *serum* of tomato juice. The serum was prepared from tomato purée by dilution to 5% soluble solids and centrifuging, and it was then treated on a column of Dowex 50, regenerated by HCl; the resulting juice had a substantially reduced *p*H (from 4·3 to 2·4) and proved to be absolutely resistant to fermentation when inoculated with *Sacch. cerevisiæ* var. *ellipsoideus* or with the osmophilic *Sacch. rouxii* at levels of about 10^7 cells per ml. juice.

Difficulties arose in cation exchange treatment of the original juice; owing to clogging by suspended particles of pulp, it was not possible to treat even highly diluted juices in an ion exchange column. Then, simple mixture of the resin with the juice and its removal by decantation was tried. The change of *p*H was measured after addition of various quantities of air-dry Dowex 50 (in the hydrogen cycle) to 100 ml. portions of freshly extracted tomato juice soluble solids 4·8%) obtained from a factory. The results are recorded in Fig. 6; at the same time the

soluble solids content fell to 3·6%. Nevertheless, with these fresh, viscous juices, this procedure was not practical either, because sedimentation of the small resin particles was slow and almost simultaneous with that of the pulp, so that separation of the resin after treatment could not be achieved satisfactorily. After several unsuccessful experiments, the problem was finally solved by immersing the ion exchanger, contained in a sieve, into the juice, as follows. Most of the surface of the body and bottom plate of a 5 kg. can was replaced by a bronze sieve screen with holes 0·25 mm. in diameter; regenerated resin was put in this "treating vessel," which was then immersed in distilled water and rotated around the vertical axis and raised and lowered periodically so that resin particles smaller than 0·25 mm. were washed out. Then, in a similar manner, it was possible to treat tomato juice, except that the juice was heated to about 80°C. to reduce viscosity. By successive treatments the mineral ion content of the juice was diminished to the desired level, usually judged by the constancy of the *p*H. The resulting juice was then evaporated *in vacuo* to the required solids content.

The keeping qualities of such purées, containing 22, 29 and 30% soluble solids, were examined during storage at 28°C. after inoculation with about 10^7 cells per g. of *Sacch. rouxii*. While untreated purées of similar concentration underwent fermentation in two days, samples treated with the cation exchange resin remained unaltered for several months, despite the fact that their e.r.h.s were very high, like those of the untreated purées.

This procedure may also be expected to help to stabilise the vitamin C content of tomato concentrates, besides improving the keeping quality, because treatment with a cation exchanger removes the metals catalysing losses of ascorbic acid. Further research is still needed here; and to discover how the acidifying action of the treatment could be offset, *e.g.* by light treatment with an anion exchange resin, or by addition of sugar, preferably fructose.

In Hungary, a popular source of vitamin C is the concentrate made from red paprika and sold in small tins as *Vitapric* or *Pritamin*; these are not heat treated, but are stabilised with preservatives. This product, which has about 22-23% soluble solids, 0·5% total ascorbic acid and a *p*H of about 5·5, could be made more stable even in the absence of preservatives by applying cation exchange. In our experience, this treatment reduces the *p*H to about 2·5, and the flavour becomes pleasantly sourish, which makes it tastier. Vitamin C in the product prepared by this new procedure is expected to be more stable than in the present preparations.

It is conceivable that the ion exchange treatment of these juices might be so arranged that, after centrifuging, the cation exchange treatment would be applied only to the serum which would then be remixed with the pulp in a homogeniser. In a similar manner, for the concentration of tomato juice, it has recently been proposed that only the serum obtained after centrifuging should be evaporated and then remixed with the remaining pulp—a procedure which is claimed to result in faster evaporation and a product of better quality.[32] It would seem worthwhile to try a combination of these two procedures, though it may be that the metallic ion content of the fraction of juice remaining in the pulp might suffice to support fermentation in the reconstituted whole juice.

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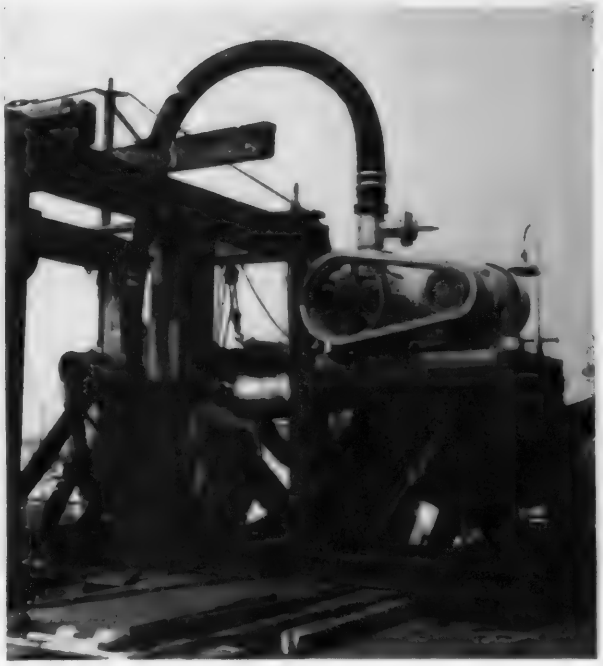
▶A rather more ambitious publication entitled *Baking with CBC* has been produced as a sequel to the small booklet, *Bakery Service*, which Craigmillar and British Creameries issued quarterly while fat was rationed. It contains both new and well established recipes for bread, cakes and pastry and some attractive ideas for cake decorations in marzipan and meringue.

▶The "350" series of vertical high temperature *Mopumps* is the subject of the latest technical publication of Rhodes, Brydon and Youatt, Ltd. The working of the pumps is described in diagrams and their specifications are given.

▶A light-hearted series of five advertisements, alleged to describe the various stages in the production of citric acid, has recently been published in booklet form by John and E. Sturge, Ltd., under the title "Fine Citric Acid in the Making."



Suction Hose Fish Pump

The Meletron Corporation in California has recently developed rubber suction and handling equipment for unloading and transferring freshly caught fish from a boat to a conveyor and from there into the cannery.

Known as the Kimmerle fish pump, the new equipment is capable of passing fish out of the suction system in such a manner as to prevent the fish from ever reaching the "source of suction" which would mangle the fish.

The new units are being used by many large canneries in the United States to unload sardines, mackerel, etc., from the boat; they are also being used to handle and transfer live bait from net to receiving tank with no damage to the fish. It is claimed that the live fish is in better condition after being moved with this equipment than if moved by hand.

Moisture-Proof Packaging

THE author of this book* is the Director of the Institute for Food Technology and Packaging, Munich, and as such he is exceptionally well qualified to apply science to food packaging. It is the express purpose of this book to permit the exact prediction of the kind and quantity of packaging needed to protect given articles, particularly foodstuffs, from moisture.

In dealing with the problem, the author had to overcome two difficulties. Firstly, the choice of packaging depends largely on the characteristics of the goods to be packed and on the influence of ambient conditions on these goods. (Comparatively little is known about this, so the research on which the book is based had to be extended to cover these aspects as well.) Secondly, research on moisture protection must take into account a number of incidental problems.

Dr. Heiss's findings are based on systematic research carried out at the Institute over a period of about eight years, partly on unpacked goods, partly on the packing materials alone, and partly on packaged goods. The packing materials which have claimed most of the author's attention are paper, plastics, aluminium foil and their combinations. The methods developed by the author permit the calculation of the keeping quality of goods packed in these materials as a function of the characteristics of the goods, the water vapour permeability of the package, and the ambient conditions.

Although, as the author points out, many aspects of the problem still require clarification, the book must be regarded as a valuable effort to apply scientific methods to a difficult question.

The laboratories in which the work was done are exceptionally well equipped, as will be confirmed by members of the Food Group, S.C.I., who visited them last summer and met Dr. Heiss (see FOOD MANUFACTURE, July 1956, p. 290).

* *Verpackung feuchtigkeitsempfindlicher Güter* (*Packaging of goods sensitive to moisture*), by Dr.-Ing. Rudolf Heiss and W. Schrüfer. Springer Verlag: Berlin, 1956. Illustr. Pp. viii+150. 24 DM. net.

New Food Research Reports

CHOCOLATE ★ BOILED SWEETS ★ SAUSAGES ★ MARZIPAN ★ TRACE METALS

SIX research reports have been issued recently by the British Food Manufacturing Industries Research Association to its members.

They are:

No. 70 "Studies on the Smoothness of Chocolate."

No. 71 "The Determination of the Relative Vapour Pressure of Boiled Sweets."

No. 72 "Studies in the Manufacture and Keeping Qualities in Sausages."

No. 73 "The Prevention of Fermentation in Macaroon Pastes and Marzipan."

No. 74 "Recommended Methods for the Determination of Trace Metals in Routine Tests of Raw Materials and Finished Products. I. Lead."

No. 75 "Measurement of Particle Size. III. The Measurement of the fineness of Food Products in Powdered Form by the Air-permeability Method of Lea and Nurse."

Following are some of the main points concerned:

Chocolate

The eating quality of chocolate depends to a great extent on its smoothness to the palate, which in turn is related to the size to which the sugar and cocoa particles have been reduced in the refining process during manufacture. The measuring of particle size and the control of the grinding process in the factory has long occupied an important place in the Association's programme of research.

Report No. 70 describes experiments to check the limits of particle size below which the palate is unable to detect the particle. The importance of this limiting size is that, for complete absence of grittiness in the finished product, the grinding operations must ensure that all particles of sugar or cocoa must be reduced to this size and that any further reduction of size is an unnecessary waste of power consumed in grinding. The figure of 25 microns put forward many years ago by H. M. Mason (*Analyst*, 1933, **58**, 440) is shown to be broadly correct by direct tasting tests on a number of graded experimental mixtures and is confirmed in the report by considerations of other evidence, including considerations of the physiological aspects of taste perception.

Report No. 75 is the third in a series of investigations into methods of measuring particle size. The particular method here described gives a single figure for fineness by measuring the pressure required to force a current of air through the dry, particulate material tamped down in a standard manner to a bed of standard dimensions. Chocolate, of course, has to be defatted before the test can be carried out. The method gives important information about the average size of the particles present.

"The Estimation and Control of the Efficiency of Chocolate Refining Operations" deals on a theoretical basis with the assessment of power-requirements in relation to palate-smoothness, and it is hoped that it will make a useful contribution to the subject of chocolate refining on its economic side.

Boiled sweets

The question of the keeping qualities of boiled sweets and other sugar confectionery products has been for a long time the basis of much research by the Association. Studies of the vapour pressure of sweets in relation to composition is a very important aspect of this work, and *Research Report* No. 71 describes the application of a method employed by Landrock and Proctor (*Food Tech.*, 1951, **5**, 332-7) to boiled sweets and compares it with the dew-point and other methods previously used.

Macaroon paste and marzipan

Fermentation in blocks of macaroon paste and marzipan supplied to bakers has at times proved a source of trouble and complaint to the manufacturers. Since the addition of preservatives to these materials is precluded by regulations, the prevention of fermentation, or at least the great reduction in the tendency of pastes to ferment, has to be accomplished by close attention to their compositions. In the Association's latest report to its members on this subject (No. 73) a method of achieving the desired result is described which does not detract from the flavour or baking qualities of these materials.

Sausages

Problems attending the manufacture and marketing of sausages have received much attention from the Association. Report No. 72 summarises investigations into three of the problems with which sausage manufacturers are concerned, namely, the loss of preservative from sausages during storage, the use of phosphates as emulsifiers in sausages, and the effect of different manufacturing techniques on the appearance and storage properties.

In the investigation of the loss of sulphur dioxide preservative from sausages, each of the normal ingredients were tested in turn and the effects of storage temperatures on the rate of loss was studied. The retention of the preservative is important, particularly as its presence helps to retain the desirable meat colour.

The use of phosphate emulsifiers in the manufacture of sausages has received much attention in recent years and patents have been granted covering the use of particular phosphates or combinations of phosphates. The present investigation was concerned with the effect of the use of some commercially available phosphate emulsifiers on the loss of fat during cooking and the effect of their use on the texture of the sausage.

Cooking losses were significantly reduced by the use of phosphates.

Determination of trace metals in foods

Present-day legislation is tending towards the close control of metallic contamination in foods, and reports carrying recommendations for the limits of arsenic, lead, copper, tin and zinc have been issued during the past few years by the Food Standards Committee of the Ministry of Agriculture, Fisheries and Food. Compliance with these recommendations calls for close attention by food manufacturers who are faced with the necessity of applying routine tests in their factory laboratories. The Association, helped by representatives of member firms, who have formed a Special Panel on Metallic Contaminations, intends to issue a series of reports. The first of these has now been issued on the estimation of lead (*Research Report* No. 74).

Reports Nos. 70, 71 and 75 were prepared by Mr. J. Kelleher, M.SC., A.R.I.C., who, in addition, was author of a publication, "The Estimation and Control of the Efficiency of Chocolate Refining Operations." No. 72 was prepared by Mr. J. I. Anderson, M.SC., and Mr. D. J. Locke, M.A. No. 73 was produced by Mr. N. R. Jones, B.SC., A.R.I.C. No. 74 was prepared by a special panel on Metallic Contaminations.

TALISMANIC

IT has been a pleasure to read this book* with the aim of reviewing it. So many books with a title bearing a statement or question about world hunger or starvation are being published that it must be supposed that they satisfy some public demand and involve the publishers in no loss. Yet their educative value is doubtful. None of them shows aptitude to discuss nutritional or other biological principles on which the answers about adequacy of food must turn; so the public remains in ignorance withal.

In two chapters on known and potential methods for augmenting food production, Prof. Oser gets (or "rates," as an American might say) only zero plus. He relies on snippets picked up here and there, such as the estimate that Indonesia could increase its average yield of husked rice by 308 lb. per acre by applying 88 lb. of double superphosphate. Economist Prof. Oser does not give any specific hint how the Indonesians (etc.) could afford the talismanic fertiliser or whatever: which is sad in the light of the warm-hearted thoughtfulness elsewhere in the book.

This book resembles the others in referring importantly to F.A.O. statistics which relate only to commodities so as to conceal those vital features about food output—such as the basic role of leguminous plants—that do not enter into trade. The formula is familiar (it was followed by Lord Boyd Orr, who highly commends this book); yet *Must Men Starve?* is a work with a difference. For one thing, it gives Malthus' case at useful length, and discusses it (or him) scathingly.

From that starting-point, Prof. Oser offers economics in eight chapters having such titles as War and Hunger; Land Tenure, Usury and Poverty; The Role of Industrialisation in Underdeveloped Areas; Commercial Policies; and Foreign Investment. The final chapter is a study of food, population, land tenure, etc., in Puerto Rico. The author's main concerns are to point out the factors of misery, and to suggest that industrialisation can be a powerful force for inducing change, development, and improved living.

Prof. Oser impartially exposes many examples of "grinding the faces of the poor cultivators" under "white" (U.S., French, British) domination or by local landlords. Coupled with these are suggestions for promoting economic development so as to benefit not just the investing country, and to bring within reach the fertilisers, irrigation equipment, cooking fuel, and other things needed by over-populated and "backward" countries. Prof. Oser qualifies his ideas with cautions; these are mostly about policy, but a few realistic points like the need for drainage of salty land, and the fact that heavier cropping in the United States led to greater removal of plant nutrients from the soil, are so unusual in books of this kind that special mention is merited here.

Though I am as much an amateur in economic theory as Prof. Oser is about food production, I think this book will be a stimulus to thought about world economics in relation to population and development. *Must Men Starve?* is the work of an earnest and kindly man; and it is because I came to like Prof. Oser much more than I admire his ability to do effective sums about the Malthusian controversy, that I enjoyed reviewing his book.

HUGH NICOL.

* *Must Men Starve?* By Jacob Oser. Cape: London, 1956. Pp. xii+331. 25s. net.

Enzyme Tenderisation

An investigation of the feasibility of tenderising beef through a combination of processes of freeze-dehydration and enzyme application during rehydration prior to cooking has been undertaken by the American Meat Institute Foundation, under a research contract with the Quartermaster Food and Container Institute for the Armed Forces.

The specific research objective is to determine whether frozen-dried beef steaks can be brought to a high tenderness rating through the application of an appropriate combination of proteolytic enzymes. Collaborating in the project will be the Foundation's division of histology under the direction of Dr. Hsi Wang and the division of home economics under the leadership of Dr. C. Edith Weir.

Drs. Wang and Weir and their associates will utilise only the less tender types of beef in the new programme. Freeze-dehydrated steaks will be provided through commercial pilot production sources and these steaks will be rehydrated by soaking in water to which one or more of the proteolytic enzyme preparations has been added. Following treatment, the steaks will be subjected to histological and taste panel evaluation.

Machinery and Equipment

CHAIN SPROCKETS

J. H. Fenner and Co., Ltd.'s taper-lock sprockets and chain wheels have now been extended for drives up to 90 h.p. with Duplex and Triplex chain sprockets. These are available from stock and save the trouble and expense of reboring and keywaying. The sprockets are described as simple to mount on the shaft and the bushes can be used again after the sprocket is worn.

CAPSULING MACHINE

Now being made in this country for the first time is the French designed Astra bottle-capsuling machine, which makes capsules from special reels of foil and applies them to a wide variety of closures, ranging from screwcaps to crown corks.

The machine is claimed to cut the cost of capsuling. By producing the capsules from aluminium foil reels an initial saving of some 30% is made on the cost of raw materials alone, since it is cheaper to operate from foil reels than to use pre-formed capsules.

In addition, by combining the dual operations of making and applying the capsules on the one machine, the need for two separate machines performing two distinct operations is avoided.

The machine forms and applies each capsule with great accuracy largely owing to the use of aluminium foil reels specially developed by Venesta Ltd.

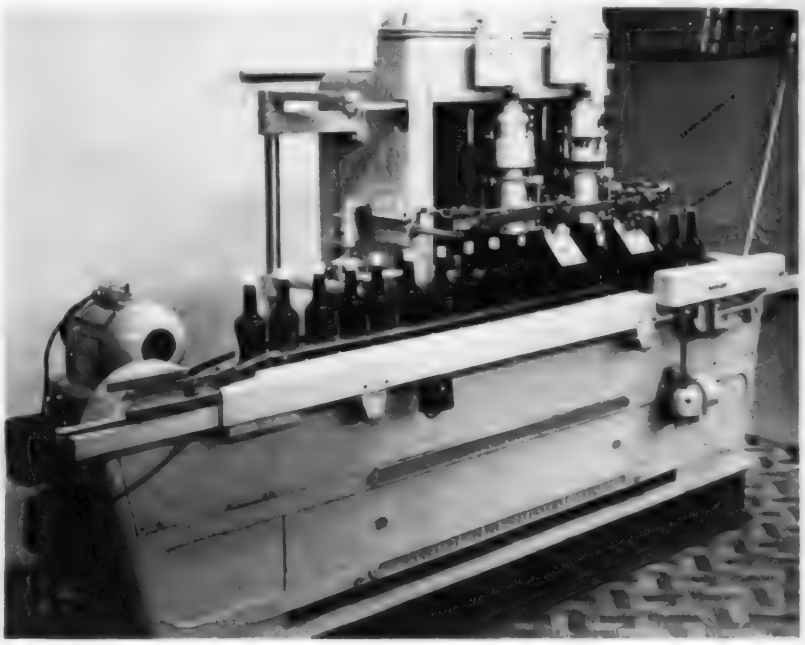
Until recently, only lacquered or coated foil reels could be used, the coating forming a "skin" which prevented aluminium particles—created by the capping operation—from falling away and fouling the machinery. Now, however, special lubricated foil reels have been introduced, the viscosity of the oil acting in the same way as the coating.

The 0·025mm. gauge foil reels are perforated at intervals by pairs of triangular holes. When the foil is fed through the machine, two triangular pegs on the punching-head engage with the holes so that correct registration of the foil beneath the cutting tool is ensured.

Astra machines have been made in France for some years by Establissments Chelle. This concern has joined with Metal Closures, Ltd., to form a company known as Chelle, Ltd., who are now making the machines in this country.

The current range comprises four models:

(i) a semi-automatic model, capacity 1,000 bottles per hr.;
(ii) a single-head automatic model, capacity 2,400 bottles per hr.;
(iii) a twin-head automatic model, capacity 4,000 bottles per hr.;
(iv) a six-head rotary model, capacity 6,000 bottles per hr.



This twin-head capsuling machine applies aluminium-foil capsules at the rate of 4,000 bottles an hr., using special foil reels made by Venesta Ltd.

DIESELS GIVE MORE M.P.G.

Diesel engines—the power units which give commercial vehicles more m.p.g. than petrol engines—are in greater demand as a result of the fuel crisis and rationing. From countries all over the world where fuel is becoming scarce or expensive requests for detailed information about the performance of the Rootes diesel engines are arriving at the London headquarters of the Rootes Group.

It is claimed that upon the same amount of fuel the Rootes diesel will usually cover twice the ground and do double the work of a similar petrol-engined vehicle under the same conditions.

In Britain the basic diesel ration has been fixed at two thirds of the basic petrol ration. This means that a 7-ton petrol-engined vehicle with, for example, an allowance of 100 gal., has a range of 1,000 miles. The Rootes diesel, it is claimed, on the same route, would exceed that figure on its 66 gal. by over 300 miles.

Diesel engines are also bringing greater economy to the lighter commercial vehicles. In the ¾- 2-ton class the new 54 b.h.p. Rootes light diesel engine has won a reputation for economy.

Two fully loaded Superpoise 1½-ton vehicles, one powered by the light diesel and the other by the o.h.v. petrol engine, were recently road-tested by an independent team of experts. Results showed that on continuous running the diesel returned 38·7 m.p.g. compared with the creditable figure of 23·2 m.p.g. for its petrol-engined counterpart.

TELEMATIC WEIGHING

The first of a new type of Telematic weighing system for sugar beet has been installed at the Arlöv sugar factory in the south of Sweden.

Automatic and largely electronic in operation, the new system has been launched by AB Stathmos, of Eskilstuna, the scale and weighing machine manufacturers owned by the Swedish Co-operative Union.

The installation consists of two lorry weighbridges, one for weighing the lorries and trailers loaded with

Telematic weighing system for sugar beet.

sugar beet delivered by the farmers and the other for obtaining the tare weight of the empty vehicles. When the loaded lorry is driven on to the first weighbridge, certain code figures are tabulated on the keyboard. These include the numbers representing the farmer, district, lorry, estimated quantity, etc. When the weight is registered these code figures are registered at the same time on the delivery form. After unloading, the tare weight of the vehicle is taken on scale No. 2, this being registered on the same form. A copy of this form is handed to the farmer's representative as a receipt and all the weighing data are transferred to a hole tape perforator, where the details are punched automatically. Each day, the tape is sent to the head office of the sugar factory, where a tape record machine reproduces the data in the form of punch cards. From these cards all the accounting, book-keeping and statistical recording are done automatically.

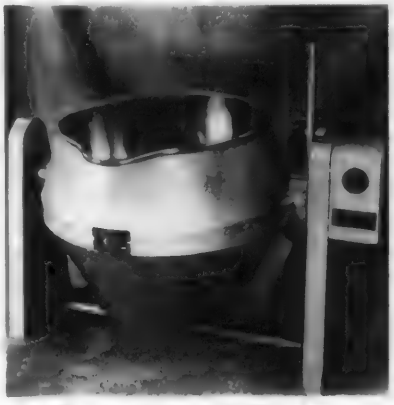
ELECTRIC JACKETED PAN

An electric jacketed tilting pan has been produced by the Stabilag Co., Ltd., in conjunction with William Brierley, Collier and Hartley, Ltd. Tests were recently carried out on the new unit at an old established toffee factory and its performance compared with an equivalent steam jacketed unit.

It was found to be just as efficient for making the toffee as the steam jacketed pan, though the actual boiling time was slightly longer. Certain modifications were incorporated at the suggestion of the toffee manufacturers. The kilowatt load was slightly raised to bring the electric jacket unit into line with the equivalent steam-operated pan. It is designed for use on three phase supply, and an energy regulator controls the heat input from 0-100% of electrical energy. An arbitrary dial on the regulator makes it a simple matter for an operator to relate the heat input to the requirements of the product being manufactured.

Special attention has been paid to providing the unit with a clean appearance; a complete splash guard is mounted around the pouring lip to prevent ingress of contaminating materials into the heater, and in addition, a great deal of attention has been given to ensure ease of maintenance for all electrical and mechanical parts.

The cost of this new unit, with its numerous advantages, is little more than that of an equivalent steam jacketed vessel. No insurance test is required, as would be the case with a steam jacketed unit, thinner gauge materials can be used, and the vessel can be made portable so that it may be brought into operation readily and moved out of position if so required.



Electrically heated tilting pan.

An electrically heated pan is single cased and not a welded fabrication as is the steam jacketed type. This gives a considerable advantage, for the welded pan does not permit access to the inside of the jacket and the lack of essential cleaning seriously affects the efficiency of the vessel.

The electrically heated pan is of particular use to manufacturers, who lack satisfactory supplies of steam or coal gas, but have a good electricity supply.

CAKE SLICER

A slicing machine for cutting cakes and other round foods has been marketed in Italy by Brevetti Antonietti. The cake is placed on the centre of a revolving plate, which moves a set distance after each slice. It can be arranged to cut 8, 12 or 16 slices.

For advertising purposes an engraved blade can be used to mark the cut face of the food.

CERAMIC DIFFUSERS

Ceramic cylinders are now being used to replace the older method of diffusing air and gas in liquids through the medium of drilled pipe-lines. Aerox, Ltd., claim that their *Porsilex* cylinders reduce the reaction time by providing a denser stream of small air bubbles and therefore a larger surface of gas contact for reaction purposes.

Porsilex ceramic material possesses the essential characteristics of porcelain and it is available in a range of pore sizes from 200 microns to 10 microns average diameter. During manufacture the size of all constituents is rigidly governed as is the formation of the media and the temperature at which they are fired. Thus, the structure and properties of the finished ceramic elements are under complete control.

The media is usually supplied in cylindrical form for diffusion purposes, although tiles, both circular and rectangular, are also available. Suspension fittings for the elements are supplied in a wide variety of materials, including ebonite, plastic, bronze, brass and stainless steel.

The recently erected Bankside Power Station was fitted with batteries of *Porsilex* elements for the neutralisation of the scrubbing water used to purify flue gases. Aeration of the acid formed is accomplished speedily with these diffusers so that the neutralised effluent can be discharged directly into the Thames.

A somewhat different example may be found at a Luton brewery where each maturation tank is fitted with an Aerox diffuser element, adjacent to the mixing propeller. The maturation time is considerably reduced by this method of speeding reaction.

This type of aerators and diffusers can be used in many other processes.

Interior of brewery maturation tank with ceramic diffuser adjacent to impeller.

News Digest

Tea Trade Vindicated by Monopolies Commission

"The tea trade in this country is conducted on keenly competitive lines," according to the Monopolies Commission *Report on the Supply of Tea* (H.M.S.O. 3s. 6d. net.). The report completely clears the trade of any charge of monopoly. It states that the severe fluctuations in the price of tea which have taken place since decontrol have not been due to the existence of monopoly conditions or restrictive trade practices.

Referring to the practice of price notification between Brooke Bond and Lyons, the Commission is satisfied that the two companies inform each other in advance of changes in the prices of their packeted teas as "no more than a useful administrative measure which does not operate against the public interest." The reason for the arrangement is the length of time required to alter labels on the packets. The Commission also found that the Regulation of Sales Scheme is a "reasonable and practical measure," that similar schemes in Colombo are not against the public interest; that conditions of sale in London and overseas auctions are not unreasonable and that neither individual nor collective resale price maintenance in the tea trade operates against the public interest.

The severe fluctuations referred to by the Commission began at the end of 1954. Prices suddenly rose steeply, reaching 7s. per lb. in the London auctions by January, 1955. The rise was brought about by underestimation of the stock position as a result of the Assam floods and the London dock strike. Eventually the market collapsed and by the summer of 1955, the price of tea was scarcely more than half its previous level.

When additives are permissible

CONDITIONS under which chemicals could be added to foods were specified at an international expert meeting held at Geneva in order to guide countries in the formulation of food laws. The meeting was sponsored by the Food and Agriculture Organisation and the World Health Organisation.

The experts concluded that "non-nutritive substances which are added intentionally to food," such as flavouring agents, colours and preservatives, have a legitimate use in food-processing and distribution systems when they help to maintain the nutritional quality of a food, enhance its keeping quality, make foods more attractive to the consumer without deceiving him, and provide essential aid in food processing.

On the other hand, the group said, the use of additives should not be permitted when they disguise faulty processing and handling techniques, when they deceive the consumer, when they reduce substantially the nutritive value of the food, and when the desired effect can be obtained by good manufacturing practices which are economically feasible.

Particular consideration was given to ensuring safety, and the meeting agreed that each type of additive must be rigorously pre-tested and that the decision to use an additive must be based on the judgment of properly-qualified scientists.

The experts agreed that, in principle, consumers should always be informed—by labelling or otherwise—of the presence of additives in the food they buy, and that strict legal control of the use of food additives is essential. This means that trained food inspectors, food-control laboratories and reliable analytical methods must be available to enforce national regulations.

Food from Poland

Representatives of the Governments of Great Britain and Poland signed a trade arrangement at the end of last month which is to serve as a basis for trade until the end of 1959.

The arrangement provides for the issue of import licences up to a total of some £6½ million for Polish goods, including canned ham and meat, furniture, textile manufactures, machine tools, various foodstuffs, etc. Provision is also made for the issue of licences for the import in 1957 of up to 47,000 tons of Polish bacon which was the quantity imported in 1956. In addition the U.K. market remains open without restriction to imports of a number of Polish product.

The two Governments undertake not to discriminate against each other's shipping.

Leonard Hill's visit to Sydney

Mr. W. Leonard Hill, chairman of the Leonard Hill Technical Group, who is on a world tour, recently spent three weeks in Sydney, New South Wales, where he was received by his friend of many years standing, Sir Norman Nock, a former Lord Mayor of that city.

Among Mr. Hill's visits was one to the Anchor Flour Mills where he was met by Mr. Dunkley and his fellow directors and entertained to lunch. Anchor are subscribers to both FOOD MANUFACTURE and its associate publication, WORLD CROPS. Mr. Hill was told that the milling trade is temporarily experiencing a slack period. There was a poor wheat crop this year.

There is a great need in Australia for soil scientists, says Mr. Hill. The importance of trace elements is being increasingly appreciated although some people seem to think it possible to go to their seedsman and buy a packet of these substances, sprinkle them on their land and get bumper crops. The other great need is water. Australian scientists have made considerable progress in developing evaporation-retarding films which can be spread over reservoirs and lakes.

Mr. Hill left Australia for Los Angeles, *via* Honolulu in the middle of January.

Antioxidants acceptable

Four antioxidants which were studied by the Food Standards Committee in 1954, are to be allowed to be used in foods. The Government has accepted the Committee's report issued on September 22, 1954. Their use will be restricted to oils and fats, essential oils, and butter used for manufacture. In these foods and in compounded foods containing them, the antioxidants will be allowed to be present within the limits indicated in the report, namely:

Antioxidant	*Edible oils and fats %*	*Essential oils %*
Propyl, or octyl, or dodecyl gallate, or any mixture thereof	0.01	0.1
Butylated hydroxyanisole	0.02	0.1

In giving this information, the Minister of Agriculture added:

"Details of the proposed regulations, which will be introduced as soon as practicable, will shortly be circulated for consideration by the interests concerned.

"We will consider the Committee's recommendation that the use of antioxidants in food should be disclosed to the purchaser."

Metal Box will not raise prices

To help stabilise the cost of living the Metal Box Co., Ltd., will not increase their tin box prices in spite of higher tinplate prices, higher wage costs and increased transport charges.

The company hope to offset these additional costs by the increased efficiency brought about by the new modern factories they have recently built at Wisbech, Westhoughton, Carlisle and Rochester.

They will hold their present tin box prices firm until April 1, 1957, and will only review the situation again then if the economies in costs have not been achieved or if there is any other change in circumstances.

Flaked Scotch beef

A new approach to meat packing and a new range of quick frozen packs to handle the produce has been launched by Moray Firth Foods, Ltd. North Scotland produces fine beef but the problem is to deliver it to distant consuming centres in quality condition. Moray Forth Foods hope to do this by flaking the meat into wafer-thin cuts; each reconstituted "steak" consists of hundreds of layers of meat cut across the grain so that no fibre is longer than one hundredth of an inch; these flakes are reassembled, and compressed into a reconstituted solid block which is then cut and packed as separate steaks. Beef, pork, mutton and venison steaks have been successfully prepared by this method.

Two new types of processed meat have also been developed. One is *Beef Sticks*, designed on the lines of *Fish Sticks*, the meat being cut into fingers, buttered, spread with fresh shell eggs cracked in the factory and fried in deep fat. A similar process is used for *Hamlettes*, the pork being cured with the addition at the cutting stage of heather honey, which gives the ham mixture a unique full flavour. Beefburgers, similar to Hamburgers are another line which has been launched. In each case the product is packed in attractive visual packs of the type used for *Fish Sticks* with an overwrap on a waxed carton.

The firm has also redesigned its *Scotfrost* double cream pack. This was previously sold in a gold foil cup, adequate for the trade but lacking in visual impact. A new straight side spirally wrapped drum in red, white and blue has been designed for the company and is being made by the Gee Manufacturing Co. of Liverpool. It is in 2 oz. and 4 oz. sizes. The units are then wrapped in transparent paper, six drums to a pack, for storage in the conservator.

Moray Firth Foods, Ltd., are also planning to expand their trade in quick-frozen raspberries. The company has been exporting quick-frozen North Scotland raspberries for some years but production has been limited by the lack of sufficient acreage. A subsidiary firm has been launched under the name Ord Farm Products, to grow raspberries for this trade and expanded production of quick-frozen raspberries and other soft fruits is anticipated in the later part of 1957.

Changes of address

Q.V.F., Ltd., have moved to Duke Street, Fenton, Stoke-on-Trent. Tel. Longton, Staffs 32104.

Air Control Installations, Ltd., have removed to larger, modern premises at Wolverley House, Digbeth, Birmingham 5. Tel. Midland 5148.

Many personalities from the food industry attended a demonstation of Henry Simon's Select-O-Weigh automatic proportioning system at their works at Cheadle Heath, Stockport recently. Here, from left, Mr. J. G. Draycott (Henry Simon Ltd.) Mr. John A. Brockhoff (Brockhoff's Biscuits Pty. Ltd., Australia) and Mr. T. Ford (Henry Simon Ltd.) are seen standing in front of one of the machines.

OBITER DICTA

● Rock-'n-Roll is cold soup warmed up.—*Louis Armstrong.*

● Australia is the only country where we can safely give our team "home grown" steaks.—*U.S. Olympic team dietician.*

● Detectives disguised themselves as jellied-eel sellers to trap a vicious and ruthless criminal who had been on the run for four months.—*Daily Express.*

● A shopper expressed surprise at a sharp increase in the price of a tin of sardines. "Well," said the assistant very seriously, "it's the oil."—*Manchester Guardian.*

● American freighter *John Sergeant*, the first large cargo vessel to cross the Atlantic propelled by a gas-turbine, used 150 lb. of Epsom salts a day to keep the turbine blades clean.—*Daily Express.*

● Silkworms have aristocratic inclinations. Although it is possible to feed them on lettuce or chicory, once they have eaten a mulberry leaf, they will starve and die rather than eat lettuce again.—*Lady Hart-Dyke.*

● The urban council at Cannock, Staffordshire, is to remove a juke-box from its civic restaurant only one week after it was installed. Customers complained they could not talk and could not digest their food properly because of the music.—*Manchester Guardian.*

● We have perhaps been guilty of telling the story of our new discovery to the detriment of our dried milk products. One might even say—I hope you will forgive the thought—that we've not seen the wood for the cheese. —*Publicity handout.*

● A meat packer representative suggested that more hog producers ought to find it advantageous to tailor their product to the fashion in meat set by the nation's housewives. Many today are doing so.—*American Meat Institute press release.*

● Sentences on two soldiers for eating fish and chips in the street are subject to confirmation. An Army officer said afterwards: "The eating of fish and chips is not an offence under the Army Act, but it can become one if there are local unit orders against it.—*The Times.*

Biscuit factory closes

About 150 workers lost their jobs when the Northern Ireland factory of Scribbans-Kemp, at Springfield Road, Belfast, ceased production last month. Cake manufacture is continuing.

New Bristol food factory

Brains (Food Products), Ltd., Bristol, announce that work has started on their new factory at Clay Hill, where modern machinery is to be installed for the production of pies, sausages and cooked meats. It is hoped that it will be completed by Easter.

The firm employs 200 employees, and operates 18 vans on a delivery service to shops, hotels and canteens within a 50-mile radius of Bristol.

New soft drink plant

A reconstruction scheme involving the installation of £20,000 worth of new plant has been completed at the premises of Joseph Dunn (Bottlers), Ltd., Glasgow. The new equipment, which is the first of its kind in Scotland, is designed for the production of *Sunfresh*, an orange squash drink.

The new plant is on two floors of a reconstructed section of the premises—the upper floor for the manufacturing processes and the ground floor for bottling and despatch.

Sugar in bulk instead of bags

Work is progressing at Greenock, Scotland, on a bulk handling project which will transform sugar handling methods at this old established sugar port. Some months ago it was decided to convert the existing facilities to bulk handling and to this end a new company was formed under the name of Greenock Bulk Handling Co., Ltd., as a subsidiary of John Walker and Co. (Sugar Refiners), Ltd. A scheme involving £200,000 expenditure for the alteration of James Watt Dock handling facilities was prepared and is now proceeding satisfactorily. Foundations are now being laid for weighbridges while the quayside is being reinforced and alterations made to the rails which will carry the 5 ton capacity grabbing cranes. The first crane will be located in midsummer and others installed at regular intervals until the entire battery will be in use by the end of 1957. Three 10 ton hoppers are being erected on the quayside to be filled by the grabbing cranes.

The system will replace the present method whereby sugar arrives in bags and is handled by a force of some 350 men. Cargoes of sugar will in future arrive in bulk carriers a number of which have been built on the Clyde in recent years to meet this development.

Erections and Extensions

Scottish Grain Distilling Co., Ltd., are planning to build a single-storey bonded warehouse in London Road, Glasgow, E.2.

▪

William Rankin Crown Corks, Ltd., are planning to build an extension to their factory in Halley Street, Glasgow.

▪

Shredded Wheat Co., Ltd., are having plans prepared for the proposed construction of extensions to their factory at Welwyn Garden City, Herts.

▪

Kinloch (Provision Merchants), Ltd., are having extensions erected to their premises in Ovenbury Road, Stamford Hill, London, N.15, at a cost of £10,000.

▪

Emanuel Thomas and Son, Niagara Works, Swansea, South Wales, have had plans prepared for the erection of a mineral water and pickle factory on a site in Carmarthen Road, Gendros, Swansea.

▪

Weston Biscuit Co. (Edinburgh), Ltd., Slateford Road, Edinburgh, 11, have been granted an interim warrant by Edinburgh Dean of Guild Court for the erection of a biscuit factory at Bankhead Crossway, Sighthill, Edinburgh, at an estimated cost of £1,000,000.

▪

Tate and Lyle, Ltd., are having plans prepared for the erection of extensions to Thames Sugar Refinery, Silvertown, London, E.16.

▪

Tizer, Ltd., mineral water manufacturers, Vestry Road, London, S.E.5, are having a factory built at Southampton.

▪

Charrington and Co., Ltd., brewers, have had plans prepared for the erection of a bottle store at Watling Street, Chatham, Kent.

▪

J. Lyons and Co., Ltd., have had plans approved for the early construction of a tea depot on a site at Oldfield Road, Salford, Lancashire.

▪

Crispa Crisps, potato crisps manufacturers, 21, Dacre Street, Birkenhead, have had plans drawn up for the erection of a single-storey factory on a site at Duke Street and Cleveland Street, Birkenhead.

▪

Cerebos, Ltd., salt and pepper manufacturers of London, N.W.10, have had plans prepared for a warehouse at West Street and Carlisle Road, Carluke, Scotland.

Merger of two Unilever companies

Smethursts Grimsby, Ltd., became part of the Birds Eye organisation on January 1. Both are Unilever companies.

During the past year Birds Eye directors have been members of the Smethursts Board. Already Smethursts have produced 77 million Birds Eye Fish Fingers for sale through retail shops. The factory is to be considerably extended and during the first six months of 1957 it is planned to spend £335,000 on buildings, processing and packaging equipment, on extensions to quick-freezing capacity, on a chill room and new general store and also on extensive electrical developments. This year too, the Grimsby factory will be aiming to pack 2½ times as many vegetables as last year, and there will be parallel developments in the production of fish fillets and poultry.

Arising from the merger, Mr. Jackson Wallace, chairman of Smethursts, retired from that position on January 1. He first joined Bloomfields, an associated Unilever company in 1928, and served with them until 1940. During the war when Holland was overrun in 1940, the Dutch fishing fleet escaped to England and was based at Fleetwood, and Mr. Wallace was appointed to take charge of it. In 1942 he was appointed a senior assistant at the Ministry of Food as director of fish supplies. In 1952 he was appointed chairman of Mac Fisheries, a post he still holds today.

The chairman of Birds Eye, Mr. J. R. Parratt, has been with Unilever since 1934 when as a management trainee he spent three years with margarine and oil companies in England, Holland and Germany.

Birds Eye have in recent years introduced a Progress Payments scheme. All staff who have been in the company's employ for a period of 12 months are eligible, provided that the actual progress of the company during that previous year warrants any such payment. In spite of the fact that Smethursts was not a part of the Birds Eye organisation during the past year, Progress Payments will be made to all their eligible members during 1957. This payment will amount to £30 per head for all eligible full time staff over 21 years of age, and £15 per head for those under 21.

Vegetable duties

There will be no increase in the import duties on dried and dehydrated vegetables, according to the President of the Board of Trade.

Gilbey sell U.S. interest

W. A. Gilbey, wine merchants and distillers, have sold for cash to National Distillers Products Corporation the minority shareholding in W. and A. Gilbey, of Delaware. National Distillers will continue on a permanent royalty basis to produce and market Gilbey brands in the U.S.

St. Martin buy Ticklers

St. Martin Preserving Co. have bought certain assets of T. G. Tickler, proprietor of Nell Gwynn marmalade and Crosbies preserves.

Under the agreement with Tickler, St. Martin acquires certain stocks and finished goods together with the right for the next seven years to buy "on favourable terms" and sell through its own sales organisation, the whole of Tickler's production.

Brewery expansion

Programmes of capital investment and higher profits were announced in the annual reports of the chairmen of Associated British Maltsters, Ltd., and Joshua Tetley and Son, Ltd.

A new malt factory is being built by Associated British Maltsters, Ltd., at Knapton, Yorkshire as part of their policy of centralisation and streamlining. Half the funds for this were raised by an issue of £294,886 Ordinary shares. The other half is to be financed from resources.

The capital commitments of Joshua Tetley and Son, Ltd., shown in the accounts as £162,000, include the installation of new plant and machinery and the erection of a new garage at their brewery in Leeds, and the conversion of a cotton mill in Heywood, Lancashire into a store.

Shrimp and onion peeling

The peeling of shrimps, prawns and onions by outworkers will be allowed to continue until January 1, 1958, as a result of the Food Hygiene (Amendment) (No. 2) Regulations, 1956, made by the Minister of Health in conjunction with the Minister of Agriculture, Fisheries and Food. The existing prohibition on the preparation and packing of other foods by outworkers is unaffected.

The extension is to give time for further exploration of the possibilities of better methods of dealing with the preparation of these foods. The position will be considered again towards the end of the period.

New containers for taking herring to the fish market have been introduced by Birds Eye Foods, Ltd. They are large metal tanks each holding 4½ to 5 crans, and in replacing the wooden boxes normally used, it is claimed the time taken for cranning out has been reduced by a third. The fish is unloaded straight from the drifters into the tanks, which are then loaded on to lorries by means of fork lift trucks, and transported to the factory near by for quick freezing. This new method of unloading should speed up the transport of fish from wharf to factory.

Pea beetle

Occasionally during the last few years dried peas imported for processing have been found to be infected by the Pea Beetle (*Bruchus pisorum* (L)), to a degree that makes them unacceptable to the factories. It is possible that such peas might be sold to farmers for stock or poultry feed, and it has been suggested to the Ministry of Agriculture, Fisheries and Food that beetles emerging from these peas might be a source of danger to pea crops grown in this country. The Ministry does not think that this is likely to be the case.

This insect is a well-known pest of pea seed and has frequently been introduced into this country. The Ministry has, however, no evidence that it has succeeded in becoming established in our crops. Furthermore, the evidence from countries where it is troublesome does not suggest that it is likely to be able to succeed.

Mr. Heathcoat Amory's reappointment

In the reorganisation of the Government which followed Sir Anthony Eden's resignation and the appointment of Mr. Harold Macmillan as Prime Minister, the Minister of Agriculture, Fisheries and Food has been reappointed to his post. In a message commenting on his reappointment, Mr. Heathcoat Amory said: "We shall maintain the freedom of enterprise and initiative which our food manufacturers and traders need if they are to continue to meet, as they have done increasingly since decontrol, the changing needs of over 50 million consumers with one of the highest standards of living in the world."

Food topics at health congress

At the annual Congress of the Royal Society of Health to be held at Folkestone from April 30 to May 3, the following papers on food and nutrition will be read; "Antibiotics" by Dr. Ella M. Barnes, and "Radiation Preservation" by Dr. R. S. Hannan, both of the Department of Scientific and Industrial Research.

Analysts' association move

The registered office of the Association of Public Analysts has been transferred from 7-8, Idol Lane, E.C.3 to:

Bank Chambers,
16, Southwark Street,
London, S.E.1.

Strawberry flavour

A concentrated strawberry flavour, *Fragodor*, has been produced by the German firm Bohnsack and Co. It is claimed to be much stronger than the natural strawberry flavour. It does not contain alcohol and is said to be suitable for use in most foods including bakery and confectionery, and in the soft drinks industry.

Forthcoming Meetings

The Institute of Refrigeration

February 7. "Antibiotics for the Preservation of Perishable Food," by Dr. Ella M. Barnes, and "A Discussion of the possibilities of using Ionising Radiations for Preserving Foods," by Dr. R. S. Hannan. The Junior Institution of Engineers, Pepys House, 14, Rochester Row, London, S.W.1, 5.30 p.m.

Society of Chemical Industry

Food Group

February 7. "Supplements to Animal Feedingstuffs with Special Reference to Antibiotics," by M. E. Coates. Gas Show Rooms, Nottingham, 7.30 p.m.

February 13. Meeting for the reading of original papers. Society's Meeting Room, 14, Belgrave Square, London, S.W.1, 6.45 p.m.

People

Mr. W. J. Batchelor

MR. PAUL PHILLIPS, 35, has been appointed factory manager at The Friary factory of T. Wall and Sons (Ice Cream), Ltd., at Acton, West London. MR. F. WHITTAKER, aged 30, has been appointed production manager at The Friary.

*

MR. W. J. ("JACK") BATCHELOR has been appointed general sales manager of Batchelors Peas, Ltd. He joined the company in March, 1939 and was appointed field sales manager in May, 1956. During the war he won the D.F.C. as a fighter pilot with the famous 603 (City of Edinburgh) squadron. He is a nephew of the company's chairman, Lt.-Col. Maurice W. Batchelor, J.P.

*

MR. WALLACE V. SMEDLEY, chairman of the Smedley group, last month spent three weeks meeting fruit growers in Santiago, Buenos Aires and Sao Paulo. He hopes to develop a scheme which last year proved very successful. Tens of thousands of tons of high quality foreign fruit were imported to keep his nine British canneries running at a higher production rate in the slack months between cropping seasons at home.

*

Brook Motors, Ltd., announce the retirement of MR. J. P. SWAIN, manager of their Leicester sales office. Mr. Swain, who has been associated with the company for 30 years, is succeeded by MR. K. BROOM, A.M.I.E.E., who joined the firm in 1937 and underwent electrical engineering training at the Huddersfield works before being appointed technical adviser and sales engineer at Leicester in 1943, a position he has held up to the present time.

MR. L. B. LAMBERT, general sales manager of Negretti and Zambra, Ltd., since 1938, has been appointed overseas manager. MR. ARTHUR MUIR, Northern Area manager has been appointed home sales manager and is now based at their head office in London. MR. R. L. SPILLER is now chief technical correspondent in place of MR. HAYDN GREEN, who has left the company.

*

MR. C. D. LOVELL, works director of Alfred Bird and Sons, Ltd., was appointed an O.B.E. in the New Year Honours List for his work for industrial safety. He is 51 and has held several executive positions with food manufacturers, including Crosse and Blackwell, George Payne and Co., and Foster Clark, Ltd. He joined Birds in 1949. He took a leading part in establishing the first and only industrial safety training centre in this country, if not in the world, and was responsible for raising the necessary funds from Birmingham industrialists during his term of office as chairman of the Birmingham and District Industrial Safety Group.

*

MR. F. G. CLAVERING FISON, chairman of The Fison Group of Companies, which includes Fisons Milk Products, Ltd., was awarded a knighthood in the New Year Honours for public work in Suffolk. Since 1930 he has been responsible for arranging 23 mergers, bringing more than 50 companies into the Fison Group and expanding its interests into the general chemical and food industry. The turnover of the Fison Group now exceeds £35 million annually; share and loan capital and reserves amount to £22 million. Sir Frank Fison is 63.

Sir Frank Fison

Dr. J. D. Johnson

DR. JOHN D. JOHNSON, PH.D., D.I.C., has joined the chemical staff of W. J. Bush and Co., Ltd. Until recently he was head of the development division of the Beecham Research Laboratories, Ltd. Before the last war he was a lecturer at the City of Liverpool Technical College and later head of the chemical department of the Salford Technical College.

During the war he was engaged on research and production of explosives with the Ministry of Supply and subsequently concerned in the production of penicillin with the Ministry of Supply and with the Admiralty at Clevedon.

*

MR. JULIAN SALMON, a managing director of J. Lyons and Co., Ltd., was awarded the C.B.E. in the New Year Honours List for his work as honorary catering advisor to the R.A.F., an office he has occupied since 1949.

He is vice-chairman of the Caterers' Association, vice-chairman of the Hotel and Catering Institute, and a director of W. H. and F. J. Horniman and Co., Ltd., and Strand Hotel, Ltd.

*

Obituary

MR. ROBERT E. WALLIS, who was head of the food division of Frederick Boehm, Ltd., until his retirement through ill health in 1954, died on December 27. He joined the company in 1910 and was well-known throughout the food and confectionery industries.

*

MR. A. C. H. ROBINSON, chairman of Gloy and Empire Adhesives, Ltd., died on Tuesday, January 1. He could rightly be considered as one of the founders of the vegetable adhesive business in this country, having spent over sixty years of his life with this company, and the former Gloy Manufacturing Company.

Food News Overseas

German machines for salt project

The Philippine president and the cabinet have approved a request for dollar allocations for a salt project by the Paranaque Salt Farmer's Co-operative.

The Co-operative is planning to buy salt refining machinery which will produce sufficient industrial and refined salt to meet the country's requirements. The machinery, costing $108,000, will come from Germany. Total cost of the project is expected to be around $168,000.

Starch convention

An international starch convention, organised by the Cereals Research Association, West Germany, is to be held at Detmold, Germany, from April 24 to 27. The programme will be divided into three sections: Research and analysis; starch manufacture and industry; and starch fractions and derivatives. Twenty-one papers will be presented. In this country information can be obtained from Dr. Dux, Sichel Adhesives, Ltd., 6, Friars Lane, Richmond, Surrey.

Egg pulp for Germany

Australia has signed a contract with the West German Republic for the supply of 1,000 tons of egg pulp. The Australian Egg Board, say that the contract is worth £A230 a ton, nearly £5 a ton more than the U.K. price and £48 a ton more than the price of Chinese egg pulp. The West German authorities agreed to pay the higher price because of the high quality of the pulp.

The Germans are currently importing about 3,000 tons of egg pulp p.a. and the Australians hope to supply the whole of this quantity in the next contract.

A contract for 8,000 tons, worth £2 million has also been concluded with Britain.

Condensed milk process

A plan for expansion of the local manufacture of condensed milk in Jamaica was announced by the Chief Minister recently. He said that a process for the manufacture of condensed milk from butter-fat and non-fat milk solids has now been perfected and that the advisers of Jamaica Milk Products, Ltd., are satisfied that it would be possible by that process to use imported butter-fat and non-fat solids to produce at their factory condensed milk of equal standard to the condensed milk at present produced from fresh milk and in sufficient quantity to meet total local requirements.

The company expects to be able to install the necessary machinery and start production in July.

Padi pops

The manufacture of "padi pops," which are prepared from rice both as a cereal confection and as a breakfast cereal, has been handed over to private enterprise by the British Guiana Government.

The padi pops factory was established by the Social Welfare Department at Mahaicony, East Coast, Demarara, in 1951 and a series of experiments was conducted until 1955 when negotiations commenced for the sale of the factory.

The Government's policy on minor industries is to conduct research and experiments in the establishment of new industries based on local raw materials and to hand them over to private enterprise for development as soon as it is established that they have commercial possibilities. This is the second minor industry to be investigated by the Government. The first was the manufacture of guava jelly, which was handed over in 1953.

Shark liver oil

South African Fish Derivatives (Pty.), Ltd., report that a *Titan NS70* superejector separator has been installed in their subsidiary company's factory at Gansbaai, Spora Properties (Pty.), Ltd. This is being used in the shark liver factory there. Considerable quantities of shark livers are being delivered to this factory by the Gansbaai fishermen.

In the factory the livers are disintegrated and cooked in caustic soda, the resultant mixture later yielding the liver oil in the separator. Since the installation of this new machinery the yield of units of vitamin A has increased from 14,000 to 25,000.

Plastic-tin cans

Latest style in cans in America is one of combined tinplate and plastic. The body and one end of the can is made of 0·25 lb. electrolytic tinplate, but the other end is made of transparent plastic, so that the customer can see what she is buying. This can is being used by the Independent Can Co. of Baltimore, for oysters.

Fish meal in bread

The National Nutritional Research Institute has conducted over a period of months exhaustive tests in the use of fish meal in brown bread and supplies of this bread are now available in the Cape Town area, where the response has been satisfactory. Later the fortified brown bread will be sold generally in South Africa. It is claimed that the use of this fish flour increases the biological value of the bread protein.

Imitation flavours preferred

Housewives prefer an obviously imitation fruit flavour to one that really tastes like the fruit, according to Mr. George Garnatz, director of the Kroger Food Foundation. This unexpected result was discovered when the Kroger Co. submitted samples of the two flavours to its Homemakers' Reference Committee of 750 housewives who have been conducting consumer testing for 20 years.

Mr. Garnatz was one of eight speakers, who discussed the question, "What is flavour?" at a symposium sponsored by the Flavour Laboratory of Arthur D. Little, Inc. recently.

Antibiotics plus irradiation for preserving meat

Irradiation with radio-isotopes, combined with an antibiotic (tetracycline) treatment, significantly increases the shelf life of refrigerated, prepackaged red meats, according to a report by Drs. C. F. Niven, Jr., and W. R. Chesbro of the American Meat Institute Foundation, before a meeting of the Fourth Annual Symposium on Antibiotics, recently held in Washington. In some cases microbial spoilage no longer determines the shelf life of meats thus treated.

Changes in colour, dehydration and drip loss determine the effective life of displayed, prepackaged red meats that have undergone the two-pronged freshness extension treatment. Difficulties with contaminating yeasts that resist radiation and antibiotic action can be minimised by the use of Sorbistat (sorbic acid), an edible antimycotic agent, the scientists said.

Food preservation by irradiation has elicited considerable interest in the United States in recent years, largely because of a multi-million dollar Armed Forces research programme conducted by the U.S. Quartermaster Corps. (See December issue of FOOD MANUFACTURE, (p. 501.)).

Packaging

The ideal pack

The ideal frozen food package should:

Have low permeability to water vapour and oxygen.

Not allow the passage of liquids.

Be impermeable to fats and oils.

Be resistant to acids and other corrosive food components.

Exclude foreign odours and prevent the transfer of food flavours.

Have good resistance to mechanical damage. This requires that the package be made of materials having high tensile, tear, and burst strength. It is especially important for frozen food packaging that the materials used maintain the needed mechanical properties at low temperatures, that they are not affected by temperature fluctuations, and that they have high wet strength.

Have seals that remain tight under the handling conditions.

Have flexibility where desired, should not be affected adversely by low temperatures.

This definition was put forward by Mr. Marcus Karel, Food Packaging Research Laboratory, Massachusetts Institute of Technology, addressing the Super Market Institute Frozen Food Seminar.

Selling cereals these days seems to be a job of selling to children, hence this new "pirate" pack for Nabisco Foods' "Shreddies." On the back of the brightly coloured carton is a complete 1,000 word adventure story. Twelve different stories will be in circulation on the new packs. If this trend continues the cereal makers will put publishers of children's comics out of business.

BY-PASSING THE BUTCHER

Smedley's new quick-frozen pork chops are packed in a white plastic tray with a cover of transparent film. Lamb chops and mixed grill are also marketed in this way by Smedleys who say they are the first to do it on a national scale. One aim is to enable shoppers to buy all food supplies at one shop.

Safety slogans on school milk

To help impress the Highway Code on the child mind, Star Aluminium of Wolverhampton are printing safety slogans on the aluminium foil used for school milk capping. Since children have a passion for making collections, a series of designs have been issued. The "Highway Code" design is printed with symbols from the Highway Code, reminding them to study these, to "Use the Crossings Always" and so on.

Carton coding

The *Codapak* carton-coding unit, a friction-operated marking machine, is intended for imprinting code-dates, batch numbers, or other information, on the tops, bottoms or sides of packages moving past it on a conveyor. It is provided with simple means of attachment to the side-frame of the conveyor, or to any sealing or packaging machine in a production line. Since it operates by friction, no independent source of power is needed.

The type, which may represent either figures or letters, is made of wear-resistant rubber. It is inked afresh after every operation by a self-inking roller containing the ink reservoir. This needs refilling periodically; possibly once a day. Apart from this maintenance task, the machine is entirely automatic in operation.

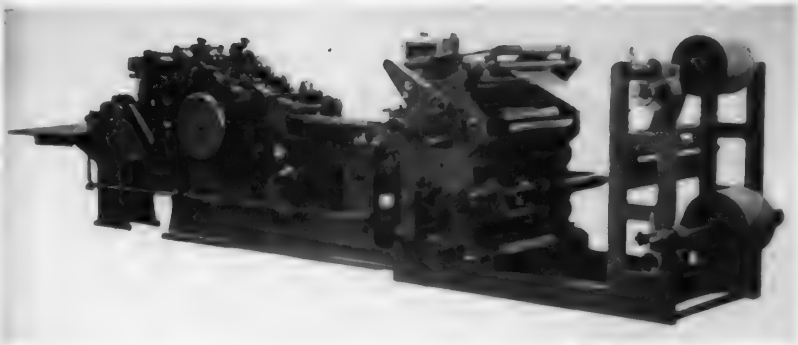
The roller on which the type is mounted is made to rotate by frictional contact with a package. When contact ceases, the type is reset to its original position by a spring, and each package is marked, therefore, in a constant predetermined position. In cases where no space is left between the packages, the spring can be removed from the roller, which then rotates continuously and imprints a random mark on each package.

Several versions of this unit are available to suit different sizes of cartons and to print in large or small characters. Makers are the Sauven Perforating Machine Co.

Packing hard fruits

Packaging methods which prevent bruising of apples and other hard fruits were discussed by Mr. C. H. Bulmer of the Printing, Packaging and Allied Trades Research Association at a recent fruit growers' conference in Maidstone.

Bruising can be caused in three ways: by dropping, by pressure and by rub-

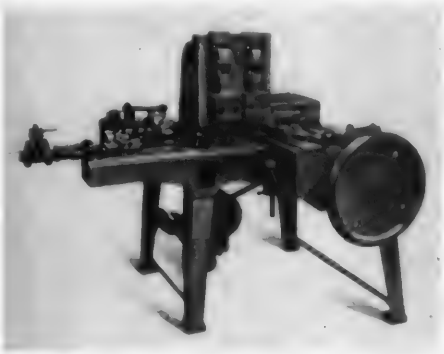


THREE GERMAN MACHINES

Our German correspondent has sent details of three packaging machines for the food industry—a high-speed bag maker, a can key maker and a plastic bag sealer.

The bag making machine (*above*) is being built in three sizes by Gartemann and Hollman in co-operation with the American firm H. G. Weber and Co. It is claimed to have an output of 500 bags per min., is economical even on short runs, is suited for combination with an aniline printing unit or can be fitted with a photo-electric cell for pre-printed reels.

The can key maker (*below*), a fully automatic machine, has been designed by the firm of Meyer, Roth and Pastor. During operation a wire is drawn from a coil and straightened in two roller mechanisms. The bending and cutting off slide for forming the handle eye incorporates a special device which clamps the wire when being bent around the mandrel. An additional device assures the accurate and square position of the key when the handle eye is being closed.



The sealer handles plastic bags, sealing them either with paper or aluminium foil or, by adapting the machine, by heat. The bags are claimed to be airtight when sealed. The bags are sealed with a clip, which is later cut by a roller. The top of the bag is ruched (*example above*) and as the next bag is fed in the first one slides to the bottom of a chute where the finished bags are collected. The average output is between 1,500 and 1,800 bags per hr. Makers are Optima-Maschinenfabrik.

bing against a rough surface. Dropping is the major cause of bruising. Experiments have shown that with Cox's Orange Pippin a drop of 3 in. produced a bruise ¼ in. in diameter, and a drop of 12 in. produced a bruise ¾ in. in diameter.

After discussing the effects of dropping, Mr. Bulmer stressed the importance of avoiding excess pressure on the fruit when the lid of the box is nailed down. "The traditional method," he said, "is to pack the fruit in such a way that the top layer is proud of the box so that when the lid is fastened on there is a 'bulge.' The theory behind this is that the 'spring' of the boards keeps the pack tight, but the vital thing is not to have excess bulge."

Experiments had shown how the use of double-faced corrugated liners on all sides of the box reduced the incidence of bruising during transit.

Overseas Enquiries

Canada: tomato products

William D. Branson Ltd., 53, Colbourne Street, Toronto, are seeking sources of supply of canned tomatoes and tomato products, such as tomato juice, tomato purée and tomato paste.

William D. Branson Ltd., are a firm of brokers and distributors of produce, groceries and other food products, selling to grocery chains and wholesalers; they have a large and continuing demand for canned tomatoes and tomato products, and anticipate being able to dispose of 250,000 cases within the next few months. The firm have connections across Canada and are already importing produce from the United Kingdom, the U.S.A. and Spain. They are considered to be a suitable connection for United Kingdom firms.

U.S.A.: beer and Scotch whisky

Southern Marine Supply Co. Inc., 202-204 West Bay Street, Savannah, Georgia, wish to obtain a source of supply for beer in lots of 500 to 1,000 cases, in cans or bottles, preferably light ale or lager type of beer. Mr. Ryan of the U.S. firm says they could do a good business with one of the lesser known brands of Scotch whisky.

Saudi Arabia: ice plant

Abdulaziz and Mohammed Al-Abdullah Aljimaih, P.O. Box 467, Jedda, who are proposing to establish an ice factory at Riyadh, are interested in offers for complete equipment for ice factories capable of producing 10 tons and 20 tons per day respectively.

Abdulaziz and Mohammed Al-Abdullah Aljimaih import a variety of products, including machinery and building materials and with the present development of Riyadh they are concentrating their activities in that area. They are considered to be a suitable connection for United Kingdom firms.

Manufacturers interested in this enquiry should write direct to the firm, at the same time, notifying the British Embassy, Commercial Secretariat, Jedda, that they have done so.

Sudan: machinery for biscuit factory

Philip Haggar and Co. Ltd., P.O. Box. 184, Khartoum, want quotations from British manufacturers for machinery for a small biscuit factory with a daily output of ½ to 1 ton.

Manufacturers interested in this enquiry should write direct to Philip Haggar and Co. Ltd., and notify the British Embassy, Commercial Secretariat, P.O. Box 801, Khartoum, that they have done so.

New Companies

Agricultural Products (Tannington), Ltd. (571243.) Mnfrs. and mchts. of animal feedingstuffs, etc. £100. Subs.: A. K. W. Edwards, 57, Severn Drive, Hinchley Wood, Surrey, and C. A. Lent.

Airedale Fisheries, Ltd. (571244.) 23, Smithville, Riddlesden, Keighley, Yks. Fish and chip friers, restauranteurs, etc. £3,000. Dirs.: N. S. Gostling, C. Crabtree, Mabel A. Gostling and W. Knowles.

Borden Sales Co., Ltd. (571249.) Mnfrs. of and dlrs. in food products, etc. £100. Subs.: F. Williamson and B. C. Dinham-Peren (solrs.), 1, Serjeants Inn, Fleet Street, London, E.C.4.

K. and K. M. Brook, Ltd. (570772.) 28, Peel Street, Marsden, nr. Huddersfield, Yorks. Bakers, pastrycooks, etc. £500. Permt. dirs.: K. and Mrs. K. M. Brook.

Aubrey Brown, Ltd. (571345.) 19/21, Cardiff Road, Luton. Agricultural produce mchts., etc. £1,000. Subs.: R. D. Maguire and J. W. L. French.

F. D. Everitt and Son, Ltd. (571028.) The Coldstore, Stretham Road, Wilburton, Ely. Market gardener. £10,000. Dirs.: F. D., Margaret E. and M. J. F. Everitt.

F. D. Everitt and Co., Ltd. (571029.) Kirkgate, Market, Leeds. Fruiterer. £8,000. Dirs.: F. D., Margaret E. and M. J. F. Everitt.

J. Goodman and Co. (Bakers), Ltd. (571112.) Baltic Bakery, Baltic Road, Sheffield, 9. £16,000. Dirs.: F. Smith and J. Goodman.

F. W. Grigson, Ltd. (571046.) 138, Praed Street, London, W.2. Butcher. £5,000. Dirs.: F. W. Grigson (ch.) and Mrs. N. M. Grigson.

Ted Haynes and Sons, Ltd. (570836.) 630, Washwood Heath Road, Birmingham. Fruit and vegetable growers, brokers, mchts. and salesmen, etc. £20,000. Dirs.: F. H. and Florence K. Haynes, F. and N. E Haynes.

Hobin, Ltd. (571049.) West Mill, Carisbrooke, Newport, I.W. Grocers, etc. £5,000. Subs.: C. H. Hobbs and H. H. Ince.

Lachman Food Products Ltd. (571213.) 33, Church Walk, Stoke Newington, London, N.16. £100. Subs.: M. I. Erlichman and H. Manski.

Langtons Bakeries, Ltd. (570997.) 68, Mill End Road, High Wycombe, Bucks. £5,000. Dirs.: C. V. Langton (permt.), Doris M., P. D. and D. R. Langton.

Laytons Confectioners, Ltd. (571089.) 48a, Renshaw Street, Liverpool, 1. £20,000. Bakers, pastrycooks, etc. Dirs.: L. S. and Mrs. M. E. Labone.

Arthur Lyon and Son, Ltd. (570974.) Egg packing station, etc. £5,000. Dir.: R. Lyon, Lyon House, Lyon Road, Hersham, Surrey.

Midland Oil and Cake Co., Ltd. (571265.) Seed crushers, mnfrs. of linseed, cotton and other cakes, oil refiners, etc. £10,000. Subs.: A. Shohet, 37, Princes Gate Court, London, S.W.7, and M. Parish.

From Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

Technical Press Review

FEBRUARY

Dairy Engineering.—Milk Cartoning in the Smaller Dairy; "Tetra-Pak" Progress in Great Britain; Planning the Medium Size Dairy.

World Crops.—Aerial Spraying Studies; Ultra-low-volume Spraying in Africa; Olive-leaf Spot Disease in Cyprus and its Control; Third British Weed Control Conference; Weed Control.

Manufacturing Chemist.—Chemicals from Petroleum; Alkyl Halides; Fatty Acid Alkylolamides.

Corrosion Technology.—A Systematic Scheme for Examining Corroded Metal Specimens; Anti-Corrosion and Anti-Fouling Paints for Ships; Combatting Heavy Fuel Corrosion and Cylinder Wear in Marine Boilers; Caustic Cracking; Avoidance of Stress Corrosion in Austenitic Steel Equipment; Silver in Chemical Plant Construction.

Chemical and Process Engineering.—Filtration; Sugar Cane Processing; Dunlop's New Synthetic Rubber Plant; Three-Dimensional Scale Models in Chemical Plant Design; Report on European Chemical Industry.

Automation Progress.—Trends in Automatic Milling and Baking; Fully Automatic Arc Welding; Ultrasonic Drilling—1; Instruments for Scanning of Variables; Automatic Variations of Lathe Drive; Transfer Lines for Structural Steel Sections; American Trends in Automation; Position Indicators in Digital Machine Tool Control; Improved Continuous Press; Trends in Car Body Making Equipment.

Petroleum.—Oil Geology of Europe; Oilfields of Holland; Search for Oil in Australia; Polymerisation of Light Hydrocarbons; Marine Search for Oil; Flags of Convenience; Cutting Oils.

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SUN LADY.—749,913. Non-alcoholic drinks and preparations for making such drinks, all included in Class 32. **Thomas James Plummer,** 43, Somerville Street, Burntisland, Fife.

REX.—B741,511. Sherry wine. **Hedges and Butler, Ltd.,** Hedges House, 153, Regent Street, London, W.1.

LAGOLIME.—748,071. Alcoholic drinks included in Class 33, all containing lime extracts. **Shandex (Edinburgh), Ltd.,** 8, Kinnoull Street, Perth, Scotland.

MONPERE.—750,612. Wines and spirits (beverages). **Evans, Marshall and Co., Ltd.,** 5, Lloyds Avenue, London, E.C.3.

PANTRY QUEEN.—749,177. Edible lard. **Dufairo Products, Ltd.,** 607, Central Markets, London, E.C.1.

DAWN.—750,728. Cooking fat. **Van den Berghs and Jurgens, Ltd.,** Unilever House, Blackfriars, London, E.C.4.

"KIPLETS."—751,080. Smoked fish. **D. A. Macrae, Ltd.,** Essex Street, Hull, Yorks.

DUNKIES.—B738,872. Doughnuts for sale in England. **J. Lyons and Co., Ltd.,** Cadby Hall, London, W.14.

LION.—738,640. Non-medicated chocolates. **R. S. McColl, Ltd.,** 142, North Woodside Road, Glasgow, N.W.

DAIRY QUEEN.—745,957. Ice cream and iced confections, all made principally of milk products. **Pacific Factors Pty., Ltd.,** School of Arts Building, Great Western Highway, Springwood, N.S.W., Australia, and c/o Mewburn Ellis and Co., 70-72, Chancery Lane, London, W.C.2.

MARBLE.—746,851. Ice cream, sauces, flavourings (not being essential oils); and preparations consisting principally of sugar and cocoa for use in making ice cream and ice confections. **Balch Flavour Co.,** 1301, Adams Street, Pittsburgh, 33, Penn., U.S.A., and c/o Forrester, Ketley and Co., Jessel Chambers, 88-90, Chancery Lane, London, W.C.2.

SHERBO.—B747,486. Sweetmeats and lollipops, all being non-medicated confectionery containing sherbet; but not including frozen confectionery. **The Maxilin Marketing Co., Ltd.,** Maxilin House, Sharples Vale, Astley Bridge, Bolton.

DOWNYFLAKE.—B748,655. Non-medicated sugar confectionery, doughnuts, doughnut mixtures, cake mixtures, pudding mixtures, custard powders, cornflour, egg and flour mixtures for food, bread crumb flour mixtures, coffee, coffee and chicory, coffee essence and coffee and chicory essence. **DCA Industries, Ltd.,** Doughnut House, Westmoreland Road, Queensbury, London, N.W.9.

EDI.—B750,907. Onion powder. **Egyptian Dehydrating Industries,** 129, Rue Sayed Koraim, Alexandria, Egypt, and c/o J. A. T. Caton and Son, Monument Station Buildings, London, E.C.4.

CRESTA.—B749,081. Bread. **Associated Bakeries (Bristol), Ltd.,** 7, Smythe Road, Ashton Gate, Bristol, 3.

BABY TOMMY.—749,901. Tomato sauce. **Holbrooks, Ltd.,** 87, South Lambeth Road, London, S.W.8.

WAG.—750,908. Fresh fruits and fresh vegetables. **Waveney Apple Growers, Ltd.,** Common Road, Aldeby, Beccles, Suffolk.

SHANDEX.—749,378. Beer, ale and porter; and non-alcoholic drinks included in Class 32. **Shandex (Edinburgh), Ltd.,** 8, Kinnoull Street, Perth.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Pet meat pack

Please supply information on the manufacture of dog and cat meat in jellied form. (Farnworth, Lancs.)

We suggest the following recipe:

Meat ingredients	50-60 lb.
Bran	15 lb.
Water, about	2 gal.

Break down the meat on a ¼-in. plate of the mincer. Mix thoroughly with the bran and water, and cook well in a steam-jacketed pan, stirring all the time. Allow to cool slightly. Line 20 lb. meat presses with *Pliofilm*, fill with the mixture and add a small quantity of hot 2% agar solution to fill any air spaces. Cover with *Pliofilm* and lightly press. When fairly cool place in refrigerator at a temperature of about 34°F. until thoroughly cool. Prepared in this way the meat should have a good shelf life without preservative. If desired, 450 p.p.m. sulphur dioxide could be used as preservative. It is customary to flavour the meat with small quantities of garlic. Cod liver oil may be added for vitamins A and D. Sometimes minced carrot is used.

Potato flour

Please supply information on the manufacture of cooked coarse grade potato flour. (Patrington, E. Yorks.)

Wash the potatoes thoroughly and place in a steamer under a steam pressure of 10 lb. for 25-30 min. Transfer to a mashing worm, then distribute the mash over the surface of a steam-heated rotating cylinder. By means of rollers it is spread into a thin film which rapidly dries on the surface of the cylinder. Scrape this film off with knives. This dried potato is known as potato flakes and it is from these flakes that refined potato flour is made.

Processed cheese

B.7967. *Please supply full details on the manufacture of processed cheese.* (Belfast)

Processed cheese is made by blending different cheeses with heat and an emulsifying agent. Cheese of varying degrees of ripeness, too low fat content or too high moisture content, can be made marketable by processing. Cheddar, Swiss, Limburger, Brick and Camembert are the most suitable varieties. To give the finished product a good flavour mix about 10% of old, well-ripened cheese with other cheese of four to seven months old. First, clean the surface and remove the rind. Add about 0·5% of common salt. Dissolve a small amount of emulsifying agent (up to 3%) in water and add to the cheese. Sodium citrate, ammonium citrate, disodium phosphate and Rochelle salt are common emulsifying agents. They give the cheese plasticity and prevent the fat from separating during processing.

Heat the mixture of ground cheese, emulsifier and water to about 150°F., stirring constantly until the desired consistency is reached. Then run the hot mixture through a special filling machine into containers lined with metal foil or moisture-proof paper. Fill and seal the containers so that the package is airtight. The cheese can then be kept for several months without developing mould.

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.7970. *Information on government contracts for prepacked foodstuffs.* (Isle of Ely)

B.7971. *Information on pea-sorting machine.* (Missouri)

B.7972. *Suppliers of fruit sauce.* (Neath, Wales)

B.7973. *Suppliers of machine for fruit juice bottling.* (Malta)

B.7974. *Analytical consultant for flour product.* (Belgium)

B.7975. *Consultant for ice-cream.* (Glasgow)

B.7976. *Information on food sterilisation.* (London, E.8)

B.7977. *Book on margarine manufacture.* (London, W.4)

B.7978. *Suppliers of pre-packed frozen meats.* (London, E.C.3)

B.7979. *Formula for imitation cream.* (Letchworth, Herts.)

B.7980. *Survey of equipment for sterilising cans.* (Malta)

B.7983. *Suppliers of edible dried blood.* (Bristol)

B.7984. *Information on manufacture of food products.* (Ilford, Essex)

B.7985. *Information on sausage manufacture.* (Belfast)

B.7986. *Formula for diabetic cake.* (Auckland, New Zealand)

B.7987. *Information on ice blocks.* (Hamburg)

B.7988. *Information on and manufacturers of nitrogen de-aerating plant.* (Camberley, Surrey)

B.7989. *Manufacturers of salt-ascorbic acid tablets for food processing.* (Worthing, Sussex)

B.7992. *Information on clearing moth from dried mushrooms.* (London, N.W.5)

B.7994. *Information on skinless sausages.* (Glasgow)

B.7995. *Formula for custard powder.* (Copenhagen)

B.7996. *Formula for choco-paste.* (Belgium)

B.7997. *Information on cap-lining machine.* (Auckland, New Zealand)

B.7998. *Formula for caramel sauce for cakes, ice cream and puddings.* (Sydney, Australia)

B.7999. *Manufacturers of peach slicing machines.* (Falkirk, Scotland)

B.8000. *Information on making groundnut oil into vegetable ghee and method of preparing table salt.* (Rangoon)

B.8002. *Information on packing foodstuffs in tubes.* (South Africa)

Recent Patents

760,044. BRITISH BAKING INDUSTRIES RESEARCH ASSOCIATION and G. H. BLANCHARD: Method of preparing dough for use in baking bread.
760,052. J. P. JENSEN: Keeping quality of milk and non-caseous milk products.
760,193. AMERICAN CYANAMID CO.: Animal feedstuffs.
760,797. OPPENHEIMER CASING CO. (U.K.), LTD.: Pack or wrapper for sausage casings.
760,901. DAIRY SUPPLY CO., LTD.: Crates, more particularly for milk bottles.
760,745. LAN-ELEC., LTD.: Angle cutting device for a food-slicing machine.
760,765. GENERAL FOODS CORP.: Confectionery product and process therefor.
760,655. BRINKERS' MARGARINEFABRIEKEN N.V.: Dough-moulding machine.
761,597. LAN-ELEC, LTD.: Food-slicing machines.
763,480. ODDYS (ENGINEERS), LTD.: Enrobing machines for confections.
763,655. O. MASSEY: Bakery equipment.
763,656. DANSKE MEJERIERS MASKINFABRIK ANDELSSELSKAB MED BEGRAENSET ANSVAR: Method and apparatus for removing butter from the containers of churns and butter-workers.
763,299. ARMOUR AND CO.: Lard shortening products.
763,563. HENKEL AND CIE GES.: Process for the manufacture of a cocoa-butter substitute.
763,715. A. F. BILLARD: Juice extracting machines.

ABSTRACTS OF BRITISH PATENTS

Bottle washer

A bottle is conveyed against a liquid stream which removes labels, etc., the liquid being filtered to remove such matter before being returned to the reservoir.—761,489. *R. Webster and Co., Ltd.*

Bottle crate

A crate, adapted to be easily loaded and unloaded by automatic means, includes compartments formed by a parallel arrangement of straight members and of pairs of members of castellated rounded-top form suspended from the straight members. At least one further straight bottle supporting member is supported on and secured to a cord-like base portion of the castellated members.—762,798. *Co-operative Wholesale Society, Ltd.*

Labelling machine

A machine for applying adhesive labels to the series of surfaces (*e.g.* bottles) brought in succession to a position at which the labels are applied, includes relatively moving picker and tripper devices. Each label adheres on its adhesive side to the picker device, and is carried to a point at which the gripper device takes the label from the picker device and applies it to one of such surfaces. The movement of such device is interrupted by a mechanism responsive to the passage of the surfaces to the label applying position.—762,780. *Purdy Machinery Co., Ltd.*

Liquid dispenser

A dispenser is pedal operated to provide a simultaneous flow of *e.g.* fruit syrup and water in the required proportions into a glass tumbler, etc. An excess pressure relief means is provided for the pedal mechanism.—761,582. *Non-Drip Measure Co., Ltd.*

Carbonated beverage

Primary and secondary containers, for the gasification and storage of liquid respectively are mounted as a unit one above the other in a frame and are provided with cooling means.—762,664. *N. G. Thompson.*

Chocolate flavouring material

Chocolate flavouring material is prepared by roasting chocolate flavour and aroma precursors which have been extracted from un-roasted cacao material.—751,121. *General Foods Corp.*

Chocolate coating of articles

The coating material is raised above its normal melting point and then sprayed through nozzles by compressed air into the article.—751,409. *National Biscuit Co.*

Confectionery product

A composition for use in a whipped sugar topping comprising an edible, water-soluble cellulose alkyl ether, sugar and a foam stabiliser, *e.g.* a sodium alginate/soluble calcium salt mixture.—760,765. *General Foods Corporation.*

Sweet manufacture and wrapping

Pieces cut from a bar of sweet material are acted upon axially by moulding dies moving in circular paths, and are then delivered to a conveyor which feeds a wrapping machine.—761,441. *F. Theegarten.*

Sweet wrapper

In a packaged sweet carton, etc., individual successive caramels are separated by a wrapper which folds partly over an adjacent side of one of the sweets to simplify wrapping.—761,098. *Rose Bros. (Gainsborough), Ltd.*

Wrapping chocolate coins, etc.

A top cover has a rim which overlaps the edge, but is of less thickness than the coin, such edge being completely covered up by a turn-up on a bottom cover.—761,260. *G.D., S.A.*

Descaling sugar factory evaporators

Evaporators are descaled by treatment in a hot alkaline solution of sequestering agent, and then recovering the agent by dropping the *p*H value to below 6 and filtering and decanting. Metal hydroxide is then added to bring the solution to *p*H 11.—761,664. *L. F. Wiggins.*

Caramel colour manufacture

A carbohydrate syrup with a reducing sugar content (calculated as dextrose) of 60 to 100% is acidified to *p*H $<4{\cdot}0$ and heated to 170-250°F. until the reducing sugar content is 20-65%; an alkali (NH_3 or NH_4 compound) is then added to increase the *p*H to 3-3·8 and the syrup is caramelised at *p*H 2·6-3·8.—759,963. *Union Starch and Refining Co.*

Dispenser for cereal flakes

A spring-rotated feed member dispenses measured quantities from a hopper and closes the latter when at rest. The spring is wound manually and a one-way clutch connects the spring to drive the member only when the spring is stressed to a certain extent.—760,844. *Southall and Smith, Ltd.*

Maturing flour

Dry flour is mixed with a perhydrate of particle size <20 micron, containing $<10^7$ particles/gm., preferably in an amount <500 p.p.m., and the mixture is allowed to stand until all the H_2O_2 of crystallisation from the perhydrate has been consumed.—761,707. *Food Machinery and Chemical Corp.*

Mixing-kneading machine

The annular space between a concentric rotor and a cylindrical mix container carries kneading rolls each of which is mounted on an angularly movable axis. 761,614. *E. A. Reiffen.*

Bread-wrapping machine

In a straight-line type machine adjustable for different loaf lengths, the loaves are received by two parallel arms which are pivotal forwardly and upwardly, and are spaced on a mounting attached to a crosshead and have fixed downward arms. 761,651. *Ormeau Bakery, Ltd.*

Dough-moulding machine

A conveyor supplies a rolled-out dough strip intermittently to a winding roller and a working roller arranged beside a conveyor roller. The working and winding rollers are mounted on a common pair of levers, so pivoted that the winding roller can move away from the conveyor roller.—760,655. *Brinkers' Margarinefabrieken N.V.*

Bread cooling device

Bread loaves hot from the oven are passed through a chamber or tunnel which is sub-divided into zones, and means are provided for conditioning air drawn from the atmosphere and for supplying it to each zone, and for exhausting used air. Control means are provided for controlling the condition of air in each zone as to volume, velocity, temperature, and relative humidity.—762,677. *Humidity Control, Ltd.*

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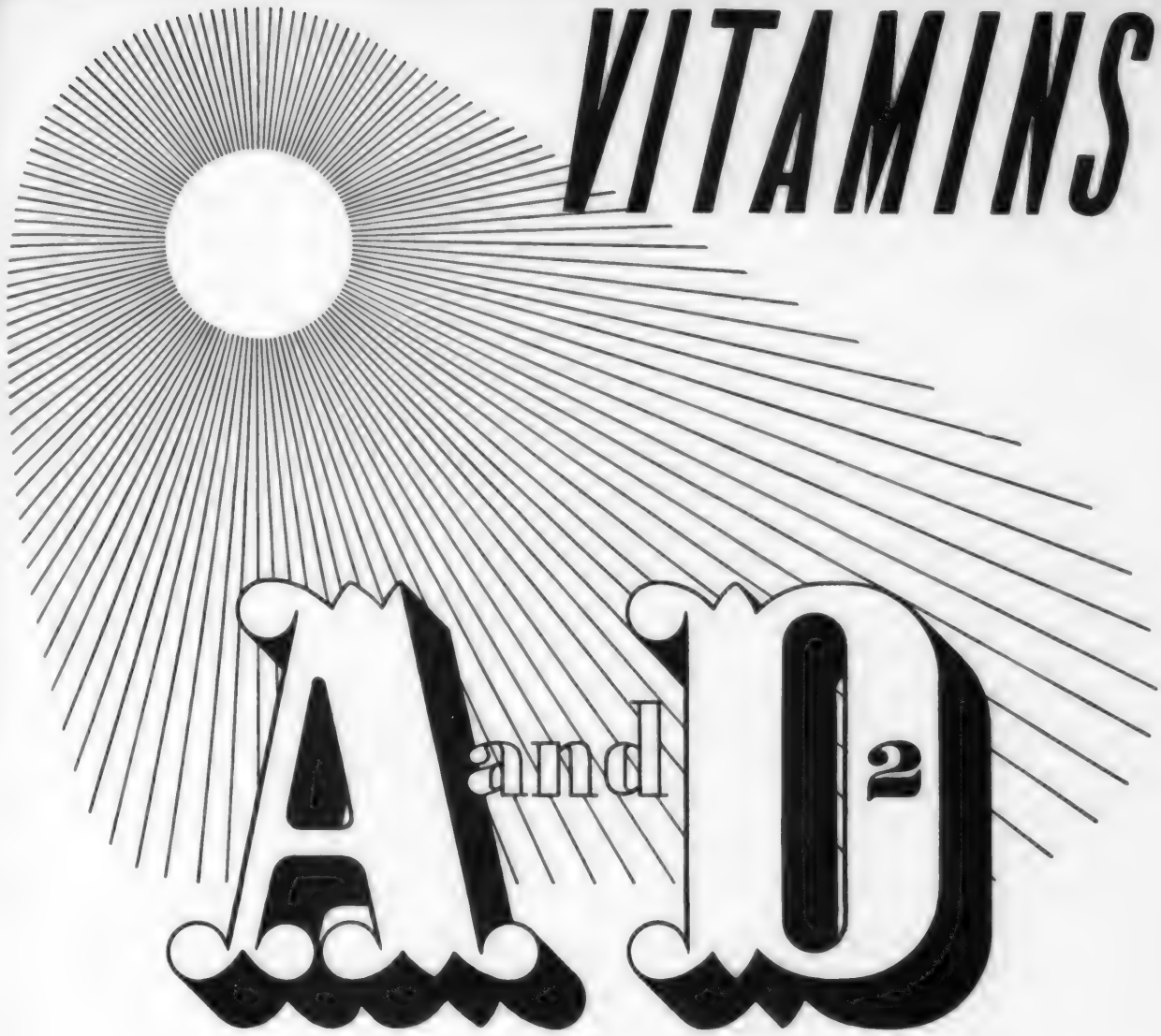

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The author's experience began at the age of twenty when he was appointed manager of coffee estates in Uganda. He was directly connected with the formation of the Kilimanjaro Native Planters' Association, now the K.N.C.U. In connection with his botanical collecting work for Kew and the British Museum he was elected a Fellow of the Linnean Society in 1928, and later, in 1930, he took charge of an Agricultural Training School. He now contributes to many journals at home and overseas, and has written several books on fibres.

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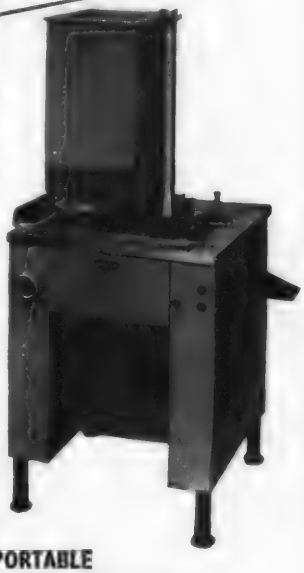

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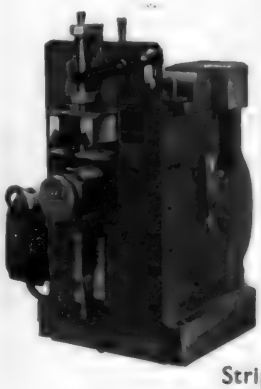

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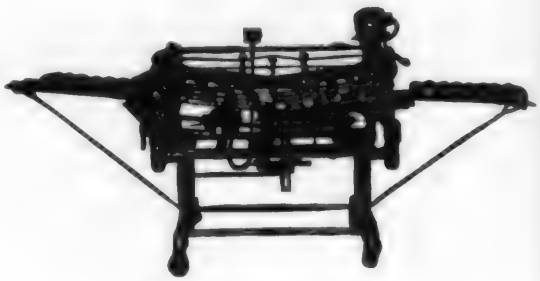

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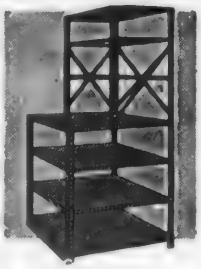

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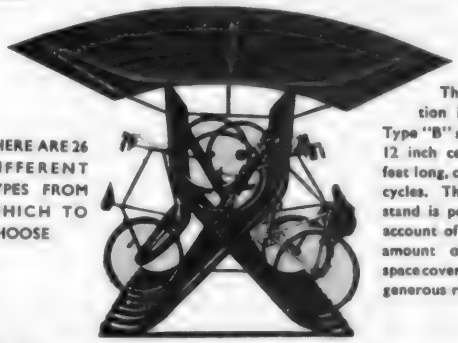

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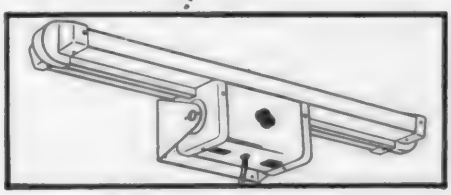

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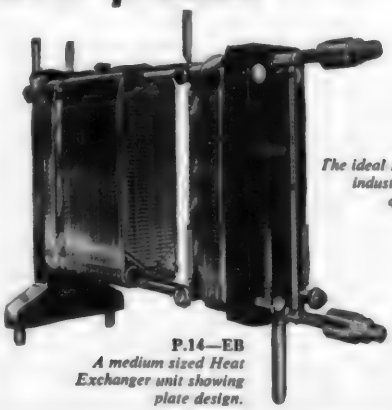

P.14—EB
A medium sized Heat Exchanger unit showing plate design.

P.5—VRB
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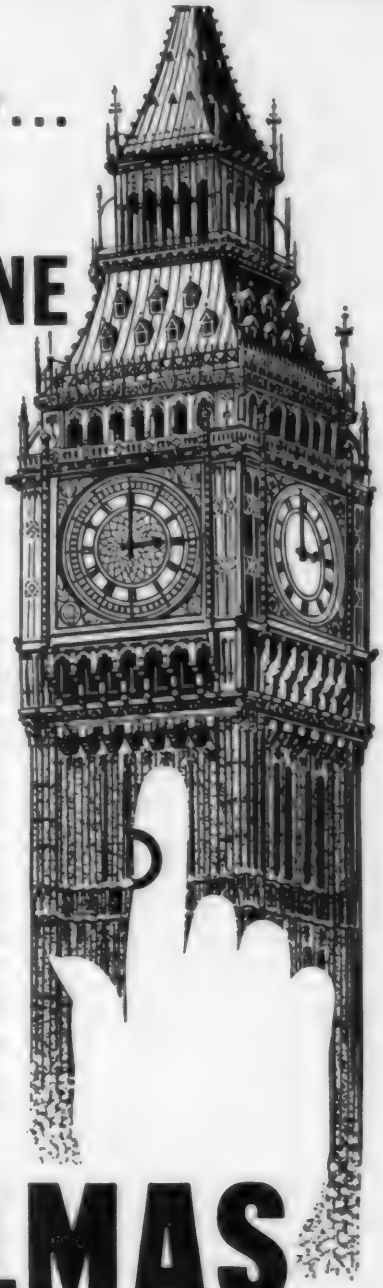

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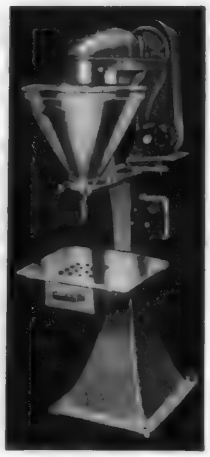

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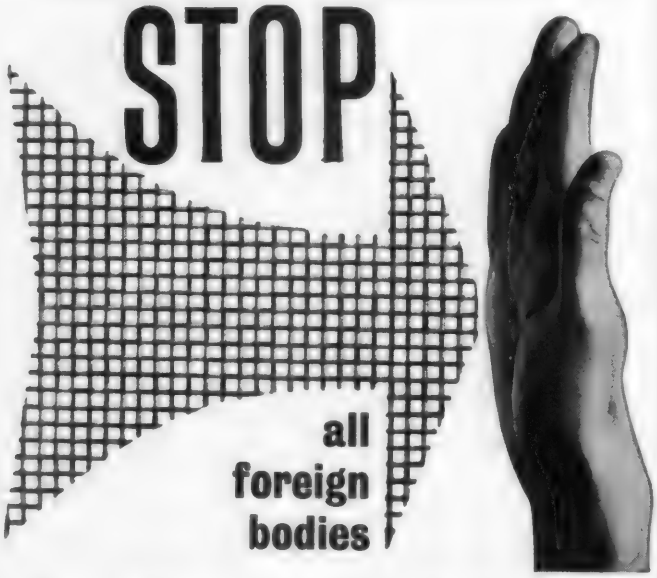

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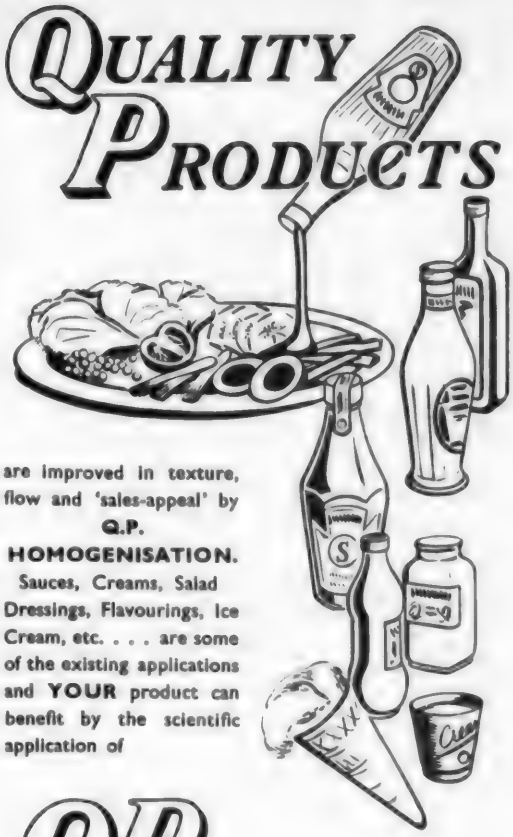

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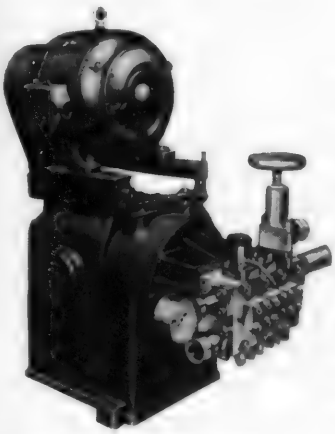

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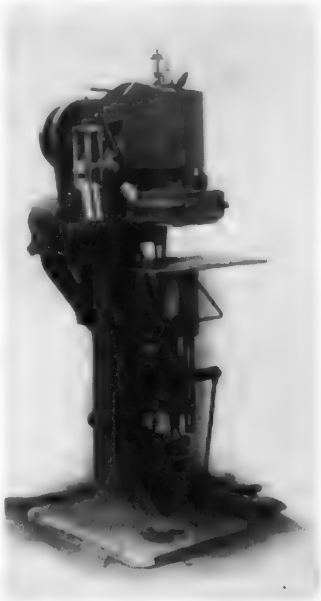

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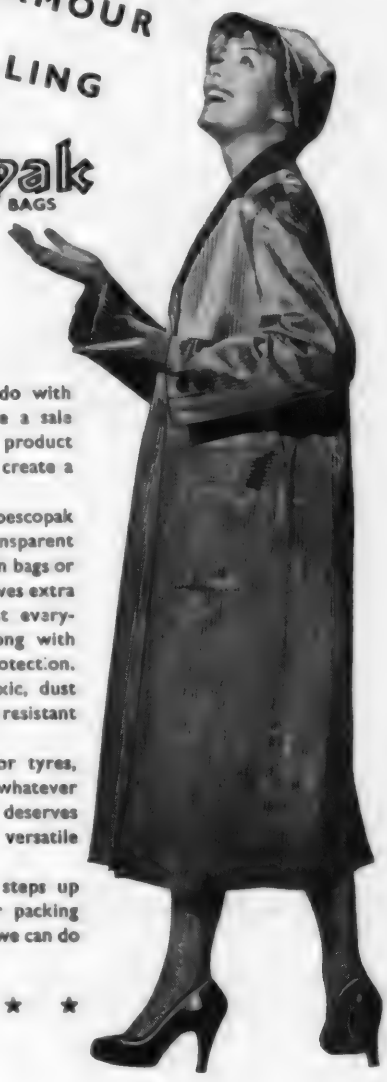

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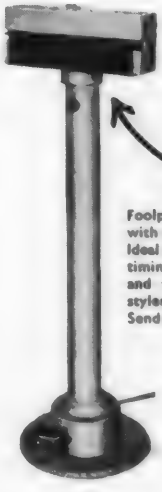

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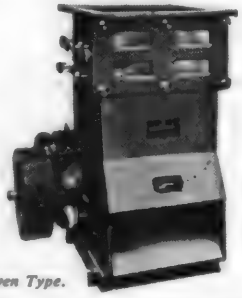

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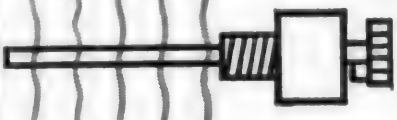

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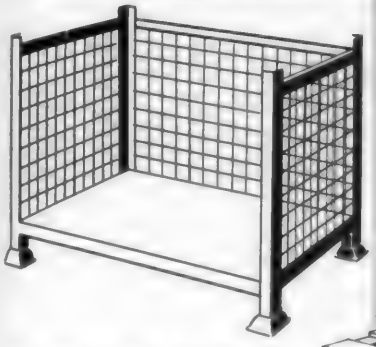
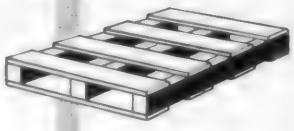
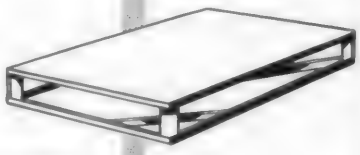


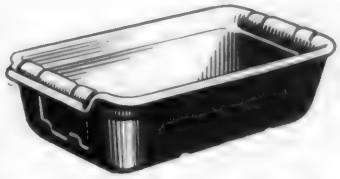
Cage type Stackable Pallets, suitable for cartoned foods, biscuits etc.



Flat Timber Pallets for handling and storing cartoned foodstuffs etc.

Flat Reversible Steel Pallets for handling cartoned foodstuffs, bottled or tinned foods etc.





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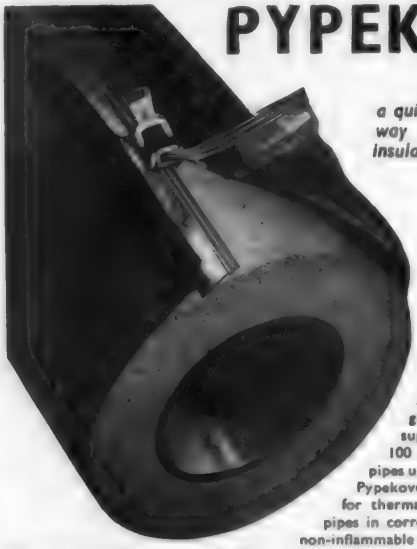

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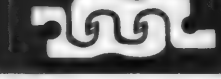

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250,000 brand new, still in manufacturer's cartons, 1 lb. and 2 lb. Aluminium Pudding Basins, lacquered inside. No reasonable offer refused.—Box B5334.

80,000 2 lb. Circular Tins complete with tops lacquered inside, brand new, still packed in manufacturer's cartons. No reasonable offer refused.—B5335.

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WELL-KNOWN Scottish Pie Makers can offer attractive terms to Agents with own transport. Goods despatched to any part of the country by passenger train. Branded line, goods packed in cardboard cartons, each containing one dozen.—Trade inquiries to V. C. Pies Ltd., Glasgow. Tel.: Maryhill 1048.

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Private and Commercial Vehicles and Office Furniture and Equipment

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LEONARD OUSTON AND MOORE have received instructions to offer the above for Sale by Auction on the Premises on Tuesday and Wednesday, February 12 and 13, 1957, commencing at 11 a.m. each day.

Catalogues in course of preparation, price 1/-.

View Day: Monday February 11, 1957, from 9.30 a.m. to 4.30 p.m., or by prior arrangement.

Auctioneers' Offices: 9, Newhall Street, Birmingham, 3. Tel.: CENtral 4394-5-6.

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BENHIL Butter and Margarine Packer; stainless steel interior Milk Cooling or Cream Ripening Vat with tubular agitator; 250 gal. stainless steel Tanks; Pasteuriser; Southall and Smith 2-lb. automatic Flour Weighing Machine; Mixers, Kneaders, Racks, Provers, Baking Sheets, etc. Your enquiries welcomed. —Sorensen Bakery Equipment Ltd., 42, Raby Street, Manchester, 16. Tel.: Moss Side 2054 and 4054. 'Grams: Rahbek.

I.M.C. 10-head Rotary Syruper. Mather and Platt 8-head Rotary Syruper. I.M.C. 6-head Rotary Piston Filler for puddings, meat rolls, etc. Mather and Platt Heavy Duty Vegetable Dicing Machine. Hammond and Smalldon Conveyor-fed Jar Closing Machine for Phoenix caps. Jackson and Crockatt twin nozzle Paste Filling Machine. B.C.H. continuous Vegetable Peeling Machine. B.C.H., 2 cwt. capacity, Paste Mixing Machine with gunmetal trough. Stainless steel "U" trough Mixing Machine, size 26 in. by 26 in. by 30 in. deep, motorised and arranged for hand tilting.—Full details from C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

FOUR Purdy World Universal Bottle Labelling Machines, motorised and fitted with centre gumming attachments and pressure wipes for square-shaped bottles. Little used since new a few years ago.—Apply C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

B.C.H. continuous Vegetable Peeling Machine, capacity 2 tons per hour. Mather and Platt Heavy Duty Vegetable Dicer with stainless steel working parts.—Details from Box B5445.

FOR Sale at attractive prices: three 100-gal. stainless steel Fruit Pulping Steamers or Storage Tanks by B.C.H., one Sugar or Juice Filterpress and Receiver, one A.P.V. Rotary Jam Cooler, one Potato Peeler or Gooseberry Snibbers by B.C.H., motorised, one 100-gal. stainless steel Peel Cooker tipping by B.C.H., one 500-gal. rectangular stainless steel Tank, Alexander Werk Mixing Machine, fully motorised, with spare bowl. All excellent condition.—Box B5430.

MALT Extract Making Plant complete. Very good complete plant for malt extract available. Consisting of evaporation vessels, condenser, vacuum pump, etc. Made by Bennett Sons and Shears.—For appointment to view apply to Box B5457.

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VACUUM Can Seamer by Ashworth and Parker, for sale. Auto feed. Capacity 3½ in. diam. by 4½ in. high. Motor driven. Photo, etc.—F. J. Edwards Ltd., 359, Euston Road, London, N.W.1.

ONE Robin Hood Junior, 5 section, 2 in. water inlet and outlet. One Robin Hood New C, 6 section, 3 in. water inlet and outlet. One Britannia No. 15K (Ideal), 8 section, 2 in. water inlet and outlet; this Boiler is at present fitted with Automatic Gas Firing Equipment. Two Riley No. 6 Underfeed Stokers complete with Worthington Simpson electrically operated boiler feed pumps; both stokers are unused. Ten Moroil Machines in good condition. Six Peerless Slicing Machines complete. Six Crypto Slicing Machines complete. One 56 lb. Crypto Potato Peeling Machine in good condition. One 28 lb. Potato Peeling Machine. Two Manlove and Elliott Hydros. One Walden Victoria Mark 1 Chocolate Coating Machine in good condition.—Box B5433.

"AUTOPACK" automatic Weigher and Filler adjustable between ¼ oz. and 2 oz. for Powders, Herbs and Crystals, etc. First-class machine, not greatly used. £100 or near offer.—Box B5434.

"ALBRO" Vacuum Bottle Filling Plant with three independent filling heads (two tinned and one specially made for acids, etc.). £100 or near offer.—Box B5435.

FOR Sale. Three Briskwrap Carton Outer Wrapping Machines, for use with sheet material. Semi-automatic in operation, these machines will wrap 800 cartons per hour, from 5 in. by 2½ in. by 1½ in. to 11 in. by 5½ in. by 4 in. in size, and will handle most heat-sealing materials. Driven by fractional h.p. motor. 4 ft. 1 in. by 1 ft. 8 in. floor space required.—Box B5436.

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FOR Disposal. Collis Hydraulic Lifting Truck, 2 ton. Overall length 6 ft. 6 in., Platform length 5 ft. by 2 ft. Ex works, London. £80.—Apply Box B5448.

BOTTLE Washer for Sale. Powley "Ryte" Washer fitted with two-speed gear, bottles 6 wide, 7-32 oz. size. Complete with gas boiler making an entirely self-contained unit. Inspection London.—Apply Box B5449.

PASSBURG Vacuum Drum Drier 27 ft. long by 4 ft. 10 in. diam. Internal capacity 206 cu. ft.—Apply Alfred Bird and Sons Ltd., P.O. Box 236, Birmingham, 12.

QUICK Freezing Tunnel. Complete installation, 18 ft. by 10 ft. by 10 ft., with two-stage 30 h.p. ammonia compresser and water economiser, together with 30, 10 and 3 by 1 h.p. motors, starters, and all connections.—Box B5456.

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FOR Sale. Two Purdy "Junior World" Labelling Machines. Two Newman Labelling Machines. All motorised. Perfect order.—Apply Box B5459.

SECOND-HAND PLANT WANTED

WANTED, 8-in. Pulping and Sieving Machine in stainless steel. Lowest price.—Box B5439.

WANTED, several twin-roll Driers, size of roll 60/80 in.—Reply Box B5440.

WANTED, Mather and Platt continuous Rotary Vegetable Peeler. State price and capacity per hour.—Box B5450.

SECOND-HAND Ascoli Ham Cooker required to take 60 to 100 hams.—Box B5453.

CONTINUOUS Freezing Plant wanted, either Creamery Package or Cherry Burrell.—Particulars to Box B5387.

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REPUTABLE House with H.Q. adjacent Eastcheap interested Agency London area food product for introduction to largest buyers.—Write, in confidence, to Box B5443.

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DAMAGED or redundant stocks of food, residues or by-products in large or small quantities required.—Send your offers to Rotunda Foods Co., London Office: 50/52, Blandford Street, W.1. Tel.: Welbeck 8465.

MEDICAL bottles; tablet bottles; jars; bottle closures, bakelite and metal purchased. Best prices paid.—Samples and full details in first instance to Noel Davold and Co., 9, Laurence Pountney Lane, Cannon Street, London, E.C.4. Tel.: MANsion House 3951-2.

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FRUIT Cannery. For Sale or To Let, in West Midlands. 15,000 sq. ft., with electricity, gas and water, labour available, room for expansion.—Box B5431.

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600

MELANGEUR by Lehmann, 6 ft. diam. cast steel bed and sides 12 in. deep with side outlet. Twin granite rolls 27 in. diam. by 13 in. face, underdriven through crown wheel and pinion. Underneath of pan fitted two-turn 2 in. diam. pancake steam coil. Ploughs and scrapers mounted on cross-head.

Melangeur, 4 ft. diam. granite bed and steel sides 6 in. deep, granite tapered rolls 19 in diam. by 9½ in. face. Underneath of ram fitted pancake steam coil. Usual ploughs and scrapers. Pulley driven.

Vert. four-roll Refining Mill by Buhler, steel-cored rolls 29½ in. by 12 in. diam., driven through helical gears by pulleys. Built-in feed hopper at top with fluted feed roll, knife and eccentric lever for engaging. Top roll fluted, others plain.

Triple-roll Inclined Refining Mill by Buhler, steel rolls 31½ in. long by 13¾ in. diam. Water cooled, fitted hand-wheel adjustment. Bottom roll off-set. Feed hopper and 3 in. diam. spiral cutter. Combined tooth flaking bar and doctor knife.

Complete Vacuum Drying Plant by Scott, comprising horizontal band drier, approx. 35 ft. long by 6 ft., with service feed hoppers, shaker feeder, condensate receivers for hot-plates, vacuum augmentor, Kek mill, screening and finished material hoppers, tailing elevator, wet and dry vacuum pumps. Motorised 400/3/50.

Twin-cyl. steam-heated Drum Drier by Henry Simon, rolls 40 in. long by 28 in. diam., 100 lb. w.p. Rolls running in plain bearings, supported in c.i. end frames with m.s. fabricated stools. Driven through double worm gear. Fitted m.s. undertrough and c.i. dam with phosphor bronze seals. Doctor knife to each roll with hand-wheel adjustment.

Two Unused Vacuum Drying Ovens by Scott, ribbed c.i. constr., 6 ft. by 4 ft. 3 in. by 4 ft. 10 in. int. with 16 steam coil shelves with 2 in. clearance for trays. Suitable 27/28 in. vacuum, fitted heavy dished door, mounted slide-rail. With Scott horizontal single-cylinder vacuum pump, condenser and fittings.

Little-used Universal Heavy Duty Mixer by Baker Perkins, size 12, type VI/H, class BSCC, 9 gal. working capacity. F.D.P. stainless steel jacketed trough for 60 lb. w.p. Trough fitted cast stainless steel 3-wing dispersion type blades corrd for heating. Compression ram type trough cover. Screw tilt, with electric 400/3/50 and oil heating units.

Double-trough steam jacketed Mixer by Werner Pfleiderer, stainless steel lined trough 33 in. by 31 in. by 26 in. deep, fully jacketed, twin "Z" blades, double geared, glanded shafts. Hand tilting. Jacket 30 lb. w.p. Driven by 20 h.p. 415/3/50 motor.

Steam jacketed Vacuum Mixer, 20 in. by 18 in. by 16 in., c.i. constr. single spur gearing, double "Z" blades, glanded shafts, hand tilting. Vacuum cover secured by swing bolts and lifting eyes at each corner. Usual connection and two sight glasses. Jacket 30 lb. w.p. 70-gal. Open Top stainless steel Vessel, 35 in. by 29 in. by 20 in. deep, radius corners and 1½ in. outlet at one end. Top edge flanged out 1½ in. and folded under.

Stainless steel Milk Tank, 36 in. by 28 in. by 13 in. deep, constr. 16G, with radius corners and dairy thread side outlet. Mounted on tubular stand. Removable strainer tank 23 in. by 18 in. by 10 in. deep with perforated bottom having ¼ in. diam. holes.

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(continued in next column)

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80,000 2 lb. Circular Tins complete with tops lacquered inside, brand new, still packed in manufacturer's cartons. No reasonable offer refused.—B5335.

80,000 brand new 2-lb. capacity Lacquer-lined Tins, complete with tops. These are still packed in manufacturer's cartons. Exceptionally cheap for quick disposal.—Box B5319.

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"FRIGIDAIRE" Low Temperature Refrigerators. 49 in. wide by 28 in. deep by 34 in. high. Ex large National User, suitable for A.C. or D.C. deep freezing, storage of ice cream, frozen foods, etc. Price £40 each. Domestic Refrigerators, Service Cabinets, and Cold Rooms also available.—A.R.C., 130, Great Portland Street, London, W.1. MUSeum 4480.

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Artificial sweetening substances, preservatives for food, preservatives for eggs; preservatives for beer, diasiatic preparations of malt, milk, ferments, preparations for purification and classification of drinking water, chemical products for purification of sugar; talc.

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637021 PONCHELLO
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637167 HOORAY
Non-alcoholic drinks not included in other classes, syrups and other preparations for making such drinks.

646787 CONSENT
Perfumery, essential oils, toilet preparations (not medicated), cosmetic preparations, hair lotions, dentifrices and soaps.

668734 ESSONIA
Esters, being chemical preparations for use in the manufacture of foodstuffs.

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Non-alcoholic drinks and preparations for making such drinks, all included in class 32, and made from fruit juices.

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702455 NO-BO
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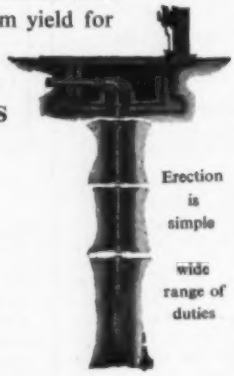

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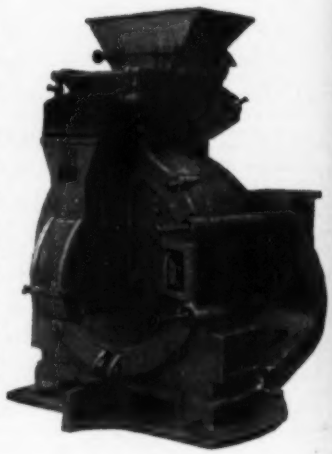

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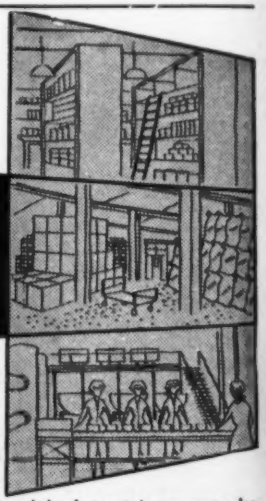

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